VOL. 7, NO. 22
November 30, 1982

Energy Research Abstracts

ABSTRACTS 59105-60710

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. Telephone (615) 576-1303; (FTS) 626-1303.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $4.50, foreign $5.65 per copy; annual cumulative index, domestic $7.00, foreign $8.75 per copy. The annual subscription price is $48.00 for domestic subscribers and $60.00 for foreign subscribers.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $150.00 for domestic subscribers and $187.50 for foreign subscribers. A single issue costs $6.50 (domestic) or $8.15 (foreign).

The following publications are available to the public on a subscription basis from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $75.00 for domestic subscribers and $150.00 for subscribers outside the North American Continent, except as listed below for *DOE Patents Available for Licensing (PAL)*. A single issue is $7.00 (domestic) and $14.00 (outside the North American Continent).

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A semimonthly current awareness bulletin covering all aspects of the nuclear fuel cycle, both front end and back end. Available as PB82-913400.

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Radioactive Waste Management (RWM)

A semimonthly current awareness bulletin covering the following management aspects: transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers. Available as PB82-902900.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)

A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

A monthly abstract journal devoted to information on coal. Through an exchange agreement, IEA Coal Research provides non-U. S. coal information of *Coal Abstracts* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. coal information to IEA Coal Research for inclusion in *Coal Abstracts*. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, the Center places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory energy analysis, and policy-related areas. To accomplish this mission, the Center builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to the Center's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of the Center's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Center has developed and maintains systems to record and communicate energy-related research-in-progress information, to catalog official DOE issue-and-policy documents, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications. The Center also maintains a full-scale publishing capability to serve special publication needs of the Department. To effectively manage DOE's technical information resources, the Center's program is one of continual development and evaluation of new information products, systems, and technologies.

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ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

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ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $150.00 for domestic subscribers and $187.50 for foreign subscribers. A single issue costs $6.50 (domestic) or $8.15 (foreign). The cumulative indexes will be available in microfiche form only. The microfiche may be purchased from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 and from Engineered Systems, P. O. Box 866, Oak Ridge, Tennessee 37830.

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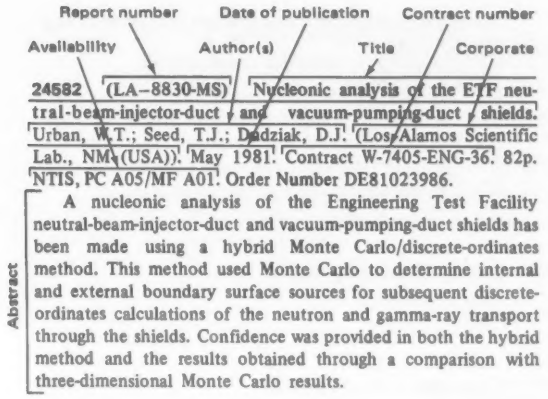
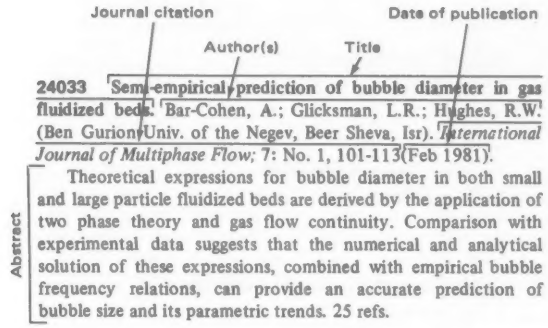
The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Report number
Date of publication
Contract number
Availability
Author(s)
Title
Corporate
24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.
Abstract
A nucleonic analysis of the Engineering Test Facility neutral-beam-injector-duct and vacuum-pumping-duct shields has been made using a hybrid Monte Carlo/discrete-ordinates method. This method used Monte Carlo to determine internal and external boundary surface sources for subsequent discrete-ordinates calculations of the neutron and gamma-ray transport through the shields. Confidence was provided in both the hybrid method and the results obtained through a comparison with three-dimensional Monte Carlo results.


Journal citation
Date of publication
Author(s)
Title
24033 Semi-empirical prediction of bubble diameter in gas fluidized beds. Bar-Cohen, A.; Glicksman, L.R.; Hughes, R.W. (Ben Gurion Univ. of the Negev, Beer Sheva, Isr). International Journal of Multiphase Flow; 7: No. 1, 101-113 (Feb 1981).
Abstract
Theoretical expressions for bubble diameter in both small and large particle fluidized beds are derived by the application of two phase theory and gas flow continuity. Comparison with experimental data suggests that the numerical and analytical solution of these expressions, combined with empirical bubble frequency relations, can provide an accurate prediction of bubble size and its parametric trends. 25 refs.

• INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. **(Los Alamos Scientific Lab., NM (USA)).** May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Bar-Cohen, A., Semi-empirical prediction of bubble diameter in gas fluidized beds, 7:24033
Dudziak, D.J., *See* Urban, W.T., 6:24582
Glicksman, L.R., *See* Bar-Cohen, A., 7:24033
Hughes, R.W., *See* Bar-Cohen, A., 7:24033
Seed, T.J., *See* Urban, W.T., 6:24582
Urban, W.T., Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles or informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

TOKAMAK ETF
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Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)
Neutron Transport
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• Contract Number Index

DOE technical literature is indexed using contract numbers under which the literature was produced. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	6:24582	LA–8830-MS

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under an Order Number, that number is included in the availability statement. An Order Number-Report Number Correlation is included for convenience.

LA–		
8830-MS	**6:24582**	**NTIS, PC A05/MF A01. Order Number DE81023986, Distribution Category STD-20d**

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SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
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59105 (CONF-820814—26) Evaluation of coking behavior in coal-liquefaction-process equipment. Lin, K.H.; Frazier, G.C.; Edwards, R.E. Jr. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA)). 1982. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE82020831.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

Formation/deposition of coke-like solids in process equipment represents one of the crucial problems in coal liquefaction processes, yet the causes for such behavior are not well understood. This paper presents the results of the state-of-the-art review in understanding coking behavior, with an emphasis on possible application to coking in coal liquids. Accessible data from the literature relevant to coking are concerned primarily with petroleum liquids and appear to be scattered, largely qualitative in nature, and sometimes inconclusive. Few experimental coking studies have been made using coal-derived liquids. Preliminary dimensional correlations that resulted from a comprehensive analysis of the coking data from preheater test runs in the Wilsonville coal liquefaction pilot plant are also presented. The correlations indicate process conditions and certain coal characteristics that may lead to incipient coke formation. Further studies and additional data are required to refine these correlations.

59106 (DOE/ET/10060—84-Vol.1) Cresap test facility. Final report, September 1, 1977-September 30, 1979. (Fluor Engineers and Constructors, Inc., Irvine, CA (USA)). Dec 1981. Contract AC01-76ET10060. 473p. NTIS, PC A20/MF A01. Order Number DE82020062.

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This is the final technical report on the work performed at the Cresap Test Facility, Cresap, West Virginia by Fluor Engineers and Constructors, Inc., and Liquefied Coal Development Corporation for the Department of Energy under Contract EX-76-C-01-1517. The report describes and summarizes the results of all work performed in operating the facility and conducting mechanical component testing. A previously issued report, Interim Report No. 1, describes the engineering and construction activities for refurbishing and expanding the Cresap Test Facility during the period from May, 1974 through September, 1977. This report is presented in two volumes. Volume I presents descriptions and data for: Operating History; Test Program; Process Discussion and Accomplishments; Computer Utilization; Health, Safety, Security and Environmental Protection; and Suggestion for Future Operations. Volume II contains: Plant Status After Shutdown; A Facility Maintenance Plan; Data Available for Plant Recommissioning; Available Operating Manuals; and Mechanical Flow Diagrams, Process Facilities.

59107 (DOE/ET/10069—89) EDS coal-liquefaction process development: Phase V. Quarterly technical progress report, January 1 to March 31, 1982. Epperly, W.R. (Exxon Research and Engineering Co., Florham Park, NJ (USA)). Jun 1982. Contract FC05-77ET10069. 335p. (FE—2893-89). NTIS (US Sales Only), PC A15/MF A01. Order Number DE82020944.

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This report is the fifteenth Quarterly Technical Progress Report for the Exxon Donor Solvent (EDS) Coal Liquefaction Process Development - Phase V. Funding is shared by the US Department of Energy, Exxon Company, USA (a division of Exxon Corporation), Electric Power Research Institute, Japan Coal Liquefaction Development Company, Phillips Coal Company, ARCO Coal Company, Ruhrkohle AG, and ENI. The Laboratory Process Research and Development studies were conducted at various Exxon Research and Engineering Co. (ER and E) facilities: Research and Development Division at Baytown, Texas; Products Research Division at Linden, New Jersey; and the Exxon Research and Development Laboratories at Baton Rouge, Louisiana. The Engineering Research and Development studies were performed at the Synthetic Fuels Engineering and Exxon Engineering Technology Departments of ER and E at Florham Park, New Jersey. The information dealing with operation of the 250 T/D Exxon Coal Liquefaction Pilot Plant (ECLP) was generated at Exxon Company, USA, Houston, Texas.

59108 (DOE/ET/10149—T4) Cold-flow studies for the H-Coal reactor. Part II. Gas-mixing model. Vasalos, I.A.; Rundell, D.N.; Bild, E.M.; Peters, M.H. (Amoco Research Center, Naperville, IL (USA); Ohio State Univ., Columbus (USA). Dept. of Chemical Engineering). 1980. Contract AC05-77ET10149. 39p. NTIS, PC A03/MF A01. Order Number DE82021814.

The gas mixing in a three-phase fluidized bed was studied in a cold flow reactor model. Experiments were conducted using nitrogen, kerosene, and extrudates of hydrodesulfurization catalyst. Utilizing Argon-41 as a tracer, the residence time distribution was studied. Based on these measurements, it was found that addition of coal fines significantly affected the gas flow inside the reactor. It was found that gas bubbles tend to flow upward in the center of the reactor, with a downward flow of gas bubbles near the walls.

59109 (DOE/ET/14700—11) Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, April-June 1982. Wiser, W.H. (Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering). Jul 1982. Contract AC22-79ET14700. 64p. NTIS, PC A04/MF A01. Order Number DE82019812.

Increase in the level of Co or Ni on 8% Mo/Al_2O_3 catalysts resulted in increased hydrodesulfurization (HDS) and hydrogenation (HYD) activities, but more importantly the HDS/HYD selectivity markedly improved. The standard 3% Co 8% Mo/Al_2O_3 laboratory catalyst underwent permanent partial deactivation of the HDS and HYD functions after reaction with indole, showing that nitrogen compounds cause permanent poisoning of this catalyst. Adsorption of various aromatic nitrogen compounds deactivated the HDS and HYD activities of a commercial $CoMo/Al_2O_3$ catalyst to a differing degree depending on the basic strength and structure of the nitrogen compound. Steric hindrance seems to be important for adsorption on HDS sites but not on HYD sites.

59110 (DOE/ET/14752—28) Advanced coal-gasification system for electric-power generation. Final report, March 20, 1980-January 15, 1982. (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 15 Jun 1982. Contract AC21-80ET14752. 323p. NTIS, PC A14/MF A01. Order Number DE82021338.

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Westinghouse Electric Corporation is engaged in the development of a pressurized, fluidized bed gasification process at its Waltz Mill site, near Pittsburgh, Pennsylvania. With the sponsorship of the Department of Energy, its precursor agencies, and the Gas Research Institute, Westinghouse has conducted this development program from 1972 to March 1980 under Contract EF-77-C-01-1514 and from March 1980 to January 1982 under Contract DE-

AC21-80ET14752. The overall objective of the program is to demonstrate the viability of the Westinghouse process for the production of low- and intermediate-Btu fuel gas for electric power generation, synthetic natural gas, chemical feedstocks, and industrial fuels. This report presents the development and technology activities performed, as well as the PDU test results obtained, during the 18-month period of Contract DE-AC21-80ET14752.

59111 **(DOE/ET/14876—11) Catalysts for upgrading coal-derived liquids. Quarterly report, April 1-June 30, 1982.** Crynes, B.L. (Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering). 7 Jul 1982. Contract AC22-79ET14876. 34p. NTIS, PC A03/MF A01. Order Number DE82020586.

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One experimental run of 240 hours was conducted using a NiMo-alumina catalyst at 350, 375 and 400°C, 3 space times, 12 MPa pressure, using a feedstock of 15 wt % SRC/process solvent. The catalyst bed was sectioned and analyzed for coke and inorganic accumulations. The packing materials used above the catalyst bed and in the first few inches of the catalyst bed itself contained a material that had collected in the interstices of the glass beads and catalyst. This material had as much as 70% ash. The glass beads seem to preferentially collect potassium and iron on their outer surfaces, whereas only iron was preferentially accumulated in the interstical zones. The coke content on the catalyst itself decreased linearly down the reactor bed from 24 wt % at the top to 10 wt % bottom. Total surface area of the catalysts also fell in the same manner. The n-pentane insolubles, amount of residue in the product, nitrogen and hydrogen contents in the product oils all indicated catalyst deactivation over the entire 240 hours of operation. Conclusions and recommendations are listed from a study that led to a development of a catalyst fouling model. This model is capable of predicting coke profiles with time and reactor positions as well as predicting hydrogenation and hydrodenitrogenation activities as functions as coke content. In another investigation titanium concentrations of 50 to 220 ppM appear to result in slower catalyst deactivation rates compared to experiments using undoctored feedstock.

59112 **(DOE/GFETC/RI—82/2) Liquefaction behavior of an Australian brown coal in comparison to that of two US lignites.** Baker, G.G.; Willson, W.G.; Knudson, C.L.; Farnum, S.A.; Farnum, B.W. (Department of Energy, Grand Forks, ND (USA). Grand Forks Energy Technology Center). Sep 1982. 35p. NTIS, PC A03/MF A01. Order Number DE82021977.

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Data presented in this report suggest the following major conclusions: (1) The Australian brown coal (predried to 10 pct moisture), at the conditions tested, resulted in lower yields than any of the US lignites or subbituminous coals tested thus far. (2) Distillate yield from the Australian coal was increased by CPU bottoms recycle operation with syngas although not increased to the same level observed for North Dakota or Texas lignites processed at similar conditions, but with hydrogen. (3) The Australian coal responded to changes in operating conditions in a manner similar to North Dakota lignites; however, the total conversion and yields were always less. (4) The Australian coal tested appears to have been deactivated during the drying process, which is known to happen to US lignites dried in the presence of air or inert gas.

59113 **(DOE/METC/SP—189) Coal-feeder development program. Morgantown Energy Technology Center topical report.** (Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center). Sep 1981. 48p. NTIS, PC A03/MF A01. Order Number DE82022077.

As this development program progressed, it became obvious that none of the coal feeders could meet all of the goals demanded by the original specifications. However, all the feeders now under development may be applied to one or more advanced coal process technology system. The most common shortcoming is the condition that the feeding action be continuous. All concepts, except the kinetic-extruder, are batch or intermittent feeder systems. A desirable goal for any feeder is that the feed rate be independent of the coal characteristics, coal additives, moisture, etc. All feeders, except the kinetic-extruder, employ a positive displacement action to force a volume of coal into a high-pressure region. Although most of the remaining program goals have not yet been achieved, there appears to be no inherent conceptual flaws which are insurmountable. Thus, the effort in this program is progressing towards solutions to the critical problem of feeding coal into advanced coal process systems. In order to completely establish the need for continuing this coal feed system development program, a study of potential applications for each feeder was performed. The results of this study are shown in Figures 10-14. Each figure shows the application of a specific concept, although the actual design details will vary from facility to facility. In order to ensure that the capital costs (or first costs) for the developing coal feed systems were within goals of this program, cost data for the lockhopper and slurry-pumping systems were gathered from the available literature.

59114 **(DOE/PC/10318—2) New potentially useful catalysts for the indirect liquefaction of coal. Final report for period to December 31, 1979.** Melson, G.A. (Virginia Commonwealth Univ., Richmond (USA). Dept. of Chemistry). 1979. Contract AC22-79PC10318. 15p. (PETC—10318-2). NTIS, PC A02/MF A01. Order Number DE82022001.

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A general procedure for the synthesis of some new, effective heterogeneous catalysts containing highly dispersed transition metal compounds on supports has been developed. The initial work involved alumina as the support material although recently the procedure has been applied to the synthesis of materials containing simple and complex oxides as supports. This procedure is different from that used previously by researchers attempting to prepare catalytic materials containing supported metal compounds. The potential catalysts were synthesized from solutions of the carbonyls $Ru_3(CO)_{12}$, $Ir_4(CO)_{12}$, $Rh_6(CO)_{16}$, $Os_3(CO)_{12}$, $Fe_3(CO)_{12}$, $Co_4(CO)_{12}$ and the supports either as powders, or as 1/8″ extrudates or pellets in the case of alumina, by a carefully designed and controlled procedure. The procedure may be conducted in the presence of air or an inert gas such as dry N_2; usually a dried, de-gassed non-polar solvent is employed as the medium. The developed procedures are similar for the synthesis of each potential catalyst, however the solvent and reaction times employed may vary with the carbonyl and support used. Total metal concentration has been determined by x-ray fluorescence or atomic absorption spectroscopy and varies between 1 and approximately 20%. The synthesized materials may be handled in air; evidence from optical and scanning electron microscope studies, x-ray diffraction, Raman spectroscopy and chemisorption experiments indicate that the catalysts have an even distribution of highly dispersed, small particle sized metal carbonyls on the support surface and there is no evidence for the presence of crystals or irregular deposits of the carbonyl on the support.

59115 **(DOE/PC/30340—T1) Theoretical study of pilot-scale PETC coal-liquefaction reactor. Final report.** Calimli, A.; Abichandani, J.S.; Shah, Y.T. (Pittsburgh Univ., PA (USA). Dept. of Chemical and Petroleum Engineering). Sep 1981. Contract FG22-80PC30340. 76p. NTIS, PC A05/MF A01. Order Number DE82017075.

It is generally accepted that the performance of a coal liquefaction reactor can be modelled by lumping the products into kinetically similar fractions. The products are usually grouped according to their solubility or boiling points. Once the lumped product parameters are identified, the performance prediction of the reactor, requires the knowledge of (a) reaction paths correlating reactants and products and (b) hydrodynamics of the reactor. In a continuous coal liquefaction reactor, coal slurry (coal + solvent) and gas (hydrogen) flow through a column (either coil or vertical tube). The reaction mixture first passes through a preheater where its temperature is raised to around 425°C. The slurry then passes through the main reactor where the temperature and pressure are kept essentially constant. The extent of conversion depends on the total residence time in the preheater and reactor. The purpose of this research program was to fit experimental data on coal liquefaction to kinetic networks. The data are obtained by the Department of Energy at Pittsburgh Energy Technology Center coal liquefaction unit. Figure 1 is a schematic drawing of the liquefaction unit at PETC. Kentucky (Homestead) coal and a coal derived solvent from their 400 lbs/day unit were used in the experiments. Tables I and II give the analysis of the coal and solvent. The products of liquefaction were characterized as Preasphaltenes, Asphaltenes,

Oils, Gas and unreacted coal, according to their solubilities, as outlined.

59116 **(DOE/PC/40785—4) Exploratory study of coal-conversion chemistry. Quarterly report No. 4, February 19-May 18, 1982.** Ross, D.S.; McMillen, D.F.; Ogier, W.C.; Fleming, R.H.; Hum, G.P. (SRI International, Menlo Park, CA (USA)). Jun 1982. Contract AC22-81PC40785. 50p. NTIS, PC A03/MF A01. Order Number DE82020736.

SRI is conducting a program on the chemistry of the conversion of coal to liquid fuels: Task A deals with mechanisms of donor solvent liquefaction; Task B is a study of the conversion of coal and model compounds in the CO/H_2O system. In Task A, determination of the products, rates, and mechanisms of central bond scission of diphenyl ether and 1,2-dinaphthylmethane in tetralin, 9,10-dihydroanthracene, and 9,10-dihydrophenanthrene allows us to determine the predominant mechanism of hydrogen transfer to these substrates. Diphenyl ether decomposes in the above three solvents by a radical addition-elimination mechanism, with defined first-order rate constants of approx. 1×10^{-7}, 2×10^{-6}, and 2×10^{-7} s^{-1}, respectively. The relative reactivity of the two substrates, the relative reactivity in the three solvents, and the positional preference for hydrogen transfer provide compelling evidence for the previously unreported single-step transfer of hydrogen from a radical to a closed-shell π-system. Efforts in Task B were concentrated on the conversion of anisole in D_2O and in tetralin at 400°C. Experiments were conducted in two different reactor systems, small glass ampoules and 1/4-in. 316 stainless steel tubes. Benzene and phenol were the major products with the rates of product formation affected by the reaction medium and the reactor walls. The rate of benzene formation was found to be more rapid in D_2O than tetralin, and somewhat greater in glass ampoules than in stainless steel reactors for 20 min. We also studied the conversion of bibenzyl in D_2O and in tetralin in stainless steel tubes at 400°C. In tetralin, toluene was the major product. In D_2O, the products were toluene, benzene, diphenylmethane, stilbene, and phenanthrene. A novel hydration scheme is suggested for the reactions of bibenzyl in water.

59117 **(MLM—2979-OP) Instrumentation for optimizing an underground-coal-gasification process.** Zielinski, R.E.; Seabaugh, P.W.; Agarwal, A.K. (Mound Lab., Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 7p. (CONF-820840—6). NTIS (US Sales Only). Order Number DE82020156.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

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The instrumentation and algorithms utilized for the Pricetown field test were proven to be effective. Since these were of modular design, they are directly applicable to a multi-module commercial UCG process. The further development of the global formalism used for the Pricetown field test can be accomplished is such a way as to allow for maximum and efficient control of the commercial UCG process. The UCG process, itself, produces a range of products that can be directly used or upgraded; however, proven instrumentation and control algorithms are required for maximum utilization of the coal resource and economic and efficient processing of the product. The instrumentation and control algorithms utilized at Pricetown can be effectively upgraded to support a commercial operation.

59118 **(ORNL/SGMP—82/1) Surface-gasification materials program. Semiannual progress report for the period ending March 31, 1982.** (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 52p. NTIS, PC A04/MF A01. Order Number DE82019890.

The objective of the Surface Gasification Materials Program is to conduct research and development on materials for application to the specific needs of coal gasification systems. The Program is divided into two subprograms: (1) the Gasification Systems Fabrication Technology Program and (2) the Materials Application and Development Program. The purpose of the Gasification Systems Fabrication Technology Program is to evaluate innovative fabrication methods which have the potential to lower costs and improve reliability and safety for gasifier vessels and components. The purpose of the Materials Application and Development Program is to conduct engineering-scale development and application of materials for coal gasification systems to ensure that the materials of construction for pilot plants and future large-scale plants can be properly selected and specified. The management of materials projects in support of surface gasification sponsored by the Headquarters DOE Gasification Division has been defined in an April 16, 1982 METC-sponsored agreement transmitted to DOE field offices and performing contractors. This agreement recognizes the lead role in fossil energy materials delegated by METC to the DOE Oak Ridge Operations Office and the Oak Ridge National Laboratory. The ORNL Fossil Energy Materials Program Office compiles and issues this combined semiannual progress report from camera-ready copies submitted by each of the participating organizations. Distribution is as shown on pages 59 to 63. Future reports will be issued on a semiannual basis to a similar distribution.

59119 **(ORNL/TM—8323) Assessment of materials and components performance in Bi-Gas, Westinghouse, and Combustion Engineering gasification pilot plants.** Hammond, J.P.; Horton, J.R. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 161p. NTIS, PC A08/MF A01. Order Number DE82020457.

Portions of document are illegible.

This report is an assessment of the performance of materials and components of three coal gasification pilot plants: the Bi-Gas Pilot Plant, the Westinghouse Process Development Unit (PDU), and the Combustion Engineering PDU. The materials and components problems at the three pilot plants reviewed are generally no longer especially pressing from the viewpoint of successful operation in order to evaluate the individual gasification processes per se. However, for viable commercial processes to emerge, certain new components must be developed, and the service lives and/or functionality of others must be improved. In some instances materials performance limitations prevent needed developments. This report details the past and current materials and components problems in the three plants and discusses needed remedial actions. Recommendations on generic work required to fill gaps are presented.

59120 **(PB—82-196932) Measurements of high-temperature high-pressure processess: a summary report. Final report Sep 75-Jun 79.** Cooper, L.; Shackleton, M. (Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.). Mar 1982. 136p. (ACUREX—79-353). NTIS, PC A07/MF A01.

The report summarizes an assessment and development of technology required to perform high-temperature high-pressure (HTHP) particulate sampling. In addition to efforts devoted to developing and testing an HTHP sampler for the EPA/Exxon Miniplant, experience was gained in the design aspects of HTHP sampling equipment and testing procedures. This experience is highlighted in the report. A background study and planning effort was directed toward possible future sampling efforts in a coal gasification plant. A state-of-the-art review of HTHP sampling was also performed. To document the materials collected, a bibliography of articles, reports, and books relating to HTHP sampling was compiled. A list of persons interested in this technology is also included. Results demonstrated that particle size distribution and samples suitable for chemical analysis can be obtained with the apparatus described in the report.

59121 **(PB—82-200601) Fischer-Tropsch catalysis. Annual report 1 Jun 80-31 May 81.** Andersen, R.A. (California Univ., Berkeley (USA). Dept. of Chemistry). Jun 1981. 14p. NTIS, PC A02/MF A01.

The report describes the reaction of some early transition alkyls of the type $((Me_3Si)_2N_2MR_2$ (M = Zr, Hf) with carbon monoxide.

59122 **(SAND—82-0956C) Thermomechanical cavity-growth modeling.** Glass, R.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 18p. (CONF-820852—1). NTIS, PC A02/MF A01. Order Number DE82020356.

From Conference on cryptosystems; Santa Barbara, CA, USA (23 Aug 1982).

Portions of document are illegible.

The results of recent field tests, laboratory studies, and modeling efforts in UCG have indicated that the thermal and mechanical properties of coal may be the controlling parameters in determining initial cavity shape. In examining this possibility, laboratory efforts have been directed at determining temperature and bedding plane dependent properties of coal. A thermomechanical model which uses these properties has indicated that the cavity shapes seen at both the Hanna and Hoe Creek test sites result from the temperature dependent properties of the coal such as the coefficients of thermal expansion and the elastic moduli. The model determines stress levels and uses a simple bedding plane dependent stress failure mechanism to determine cavity growth.

59123 **(SAND—82-0958C) Potential use of the CSAMT geophysical technique to map UCG processes.** Bartel, L.C. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 12p. (CONF-820840—11). NTIS, PC A02/MF A01. Order Number DE82020627.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

Portions of document are illegible.

Sandia National Laboratories has been developing surface geophysical techniques to map in situ processes, in particular the underground coal gasification (UCG) process. The potential use will be discussed of the controlled source audio-frequency magnetotelluric (CSAMT) electromagnetic surface geophysical technique to map and monitor the UCG process. The technique has been field tested for the UCG application by mapping coal mine fires and by mapping the Hanna II, Phases 2 and 3 and Rawlins T-2 cavities. Results of these field trials demonstrate that the CSAMT technique is an excellent technique for determining the lateral extent of the UCG process. In addition, the shape of the process is readily apparent in the raw data without extensive data reduction, and by careful design of the mapping survey; the results are not degraded by the presence of the surface plumbing. A brief description will be given of the deployment of the CSAMT for UCG process mapping and monitoring.

59124 **(SAND—82-0988C) Drying of coal in underground gasification.** Mondy, L.A.; Blottner, F.G. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 18p. (CONF-820840—10). NTIS, PC A02/MF A01. Order Number DE82020311.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

An investigation of the drying process in coal blocks is described. Detailed drying experiments were performed at 400°C on coal cylinders with the bedding planes oriented parallel and normal to the heat flux. Temperature histories and rates of liquid collection with the cylinders heated on one surface were recorded. Bedding plane orientation had negligible effect on the drying rate of Hanna coal. The drying process was modeled numerically to predict the location of the dried region in relation to the flame front for large-scale underground coal gasification tests. The code allows a moving, time-dependent boundary, an in-depth reaction and temperature dependent properties. A simplified model with a moving liquid-vapor interface was also developed and an exact analytical solution obtained. Both methods predict the dried region to extend 0.1 to 0.3 m ahead of the burn front in typical underground coal conversion processes. The drying front location was found to be dependent on the coal's thermal and physical properties, the flame temperature and the rate of burn. Experimental evidence indicates that the modeling approach is reasonable.

59125 **(UCID—19416) Selection of a numerical method for the transient simulation of the underground coal-gasification process.** Johnson, S.H. (Lawrence Livermore National Lab., CA (USA)). 25 Jun 1982. Contract W-7405-ENG-48. 9p. NTIS, PC A02/MF A01. Order Number DE82021545.

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A possible method of solving a dynamic simulation problem of in-situ gasification is discussed. The problem involves the temperature distribution and the vaporization of water near the burn surface. (LTN)

59126 **(UCRL—50026-82-1) LLNL underground coal-gasification-project. Quarterly progress report, January-March 1982.** Stephens, D.R.; Clements, W. (eds.). (Lawrence Livermore National Lab., CA (USA)). 18 May 1982. Contract W-7405-ENG-48. 24p. NTIS, PC A02/MF A01. Order Number DE82020455.

We report here the results of further analysis of data from the large block experiments. The five experiments that were completed were designed to investigate the basic burn and gasification characteristics of the Big Dirty coal seam, which is a likely candidate for UCG applications. They included burns with 1/1 and 3/1 steam/oxygen injection at two different flow-rate schedules, a burn with air injection, and a test of the controlled retracting injection point (CRIP) concept for moving the injection point into fresh coal. Results of the experiments indicate that the UCG process in Big Dirty coal is insensitive to changes in steam/oxygen ratio or flow rate over the ranges used. Our test of the CRIP concept was successful. We report a model study done to seek an explanation for a phenomenon observed in many steam/oxygen UCG experiments: namely, that the concentration of hydrogen in dry product gas tends to remain relatively constant, while the carbon dioxide and carbon monoxide concentrations vary. Using a simple model, we show that a product-gas hydrogen concentration near 50% (which is typical for steam/oxygen gasification) is stable with respect to perturbations in the system, while hydrogen concentrations considerably less than 50% (such as are typical for air gasification) are not. We have continued our historical survey of Soviet UCG experience. Around 1962, at Angren, the Soviets tried a different technique - directional drilling - for establishing the gasification channels that are needed in an underground coal seam to connect the process wells.

59127 **(UCRL—87689) Technical underground-coal-gasification summation: 1982 status.** Stephens, D.R.; Thorsness, C.B.; Hill, R.W.; Thompson, D.S. (Lawrence Livermore National Lab., CA (USA)). Jul 1982. Contract W-7405-ENG-48. 20p. (CONF-820840—1). NTIS, PC A02/MF A01. Order Number DE82020160.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

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There are three basic reasons for the recent emergence of underground coal gasification (UGC) as a leading synfuels candidate: (1) favorable projected economics, (2) ability to use coal seams that are unattractive for mining, and (3) modest environmental impact. The objectives of this summation are to list major underground coal gasification results and conclusions (particularly field-oriented results) and to briefly mention possible future UCG research and development. The eighteen field tests and ten years' experience have demonstrated technical feasibility and allow several generalizations concerning underground coal gasification. For example, burns tend to be bowl shaped after roof collapse, since ash and slag (and high water content in coal) impede downward burning. Burns appear to be symmetrical in plan view, but not in elevation view. Injection and linking at the bottom of the seam can improve performance. Heat losses begin, and heating value declines, when burns reach the roof rock. In general, heating value and chemistry appear to be insensitive to operational parameters but are sensitive to process-well geometry and overburden. Underground coal gasification produces hot (up to 600°C) gas containing particulate, tar, and steam which must be dealt with. Most UCG process experience has been in flat or gently dipping seams using the linked vertical well (LVW) method. However, the two Rawlins tests have shown that the steeply dipping bed (SDB) geometry is favorable for UCG. The controlled retracting injection point (CRIP) method may alleviate many underground coal gasification problems. With R and D money tight, we recommend that the DOE program continue to emphasize fundamental understanding. Small scale tests are valuable and cost $2 million to $4 million; industry and state government could provide cost sharing of up to 50%, thus leveraging the federal program.

59128 **(UCRL—87789) Method for initiating an underground combustion process.** Thompson, D.S.; Skinner, D.F. Jr. (Lawrence Livermore National Lab., CA (USA)). 2 Jul 1982. Contract W-7405-ENG-48. 6p. (CONF-820840—2). NTIS, PC A02/MF A01. Order Number DE82020164.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

A feature of all underground coal gasification field tests is the critical operation involving the initiation of a stable combustion process at either end of a process channel at the base of a process well completed within a coal seam. The constraints imposed by this environment have resulted in a variety of ignition system designs, none of which appears to offer a combination of the desired levels of reliability, simplicity of design, low cost, and ease of operation resulting in minimum down time for installation and for completion of the operating cycle. Two additional requirements have been imposed on the system design: (1) to ignite a coal seam at the base of a process well that is essentially horizontal, and (2) to provide a capability to repeat the ignition process through several cycles, either at the same location or after being repositioned within the injection well. The product of an effort at the Lawrence Livermore National Laboratory is a silane/propane ignition system that has been taken through the design, testing, and field operation sequence, yielding an improvement in performance over previous techniques. Pyrophoric silane provides the ignition source, and propane (or methane) serves as the sustaining fuel to ignite the coal seam. The system performed satisfactorily at the base of vertical and horizontal wells in a coal seam; it was also used to ignite remotely a pilot burner in an incinerator. Other applications are being suggested.

59129 **(UCRL—88015) UCG environmental research: summary and suggested projections.** Mead, S.W.; Wang, F.T.; Stuermer, D.H. (Lawrence Livermore National Lab., CA (USA)). 9 Aug 1982. Contract W-7405-ENG-48. 22p. (CONF-820840—8). NTIS, PC A02/MF A01. Order Number DE82020349.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

Recent UCG experiments sponsored by Government and Industry have yielded a broad and comprehensive environmental data base. Groundwater modifications involving hydrologic effects and water quality changes have been carefully documented over a period of several years at a number of UCG test sites. The effects of cavity roof collapse, including aquifer interconnection and surface susidence, have also been investigated both computationally and experimentally. The long term implications of these changes will require further study. Future research will also be guided by the need to extend our environmental knowledge to a broader range of hydrogeological conditions, to consider the application of available environmental knowledge to probable commercialization scenarios, and to explore the effectiveness of promising mitigation measures and control technologies. We have considered some specific problems at the Hoe Creek site that appear to need attention, and we discuss some general recommendations for environmental activities that we believe can help pave the way for a commercial UCG technology.

59130 **Development and status of the IGT PEATGAS Process for production of synthetic fuels from peat.** Punwani, D.V.; Rader, A.M.; Kopstein, M.J. Chicago, IL; Institute of Gas Technology (1979). 39p. (CONF-791177—1). Institute of Gas Technology, 3424 South State St., Chicago, IL 60616.

From New technologies in the use of peat conference; Bad Zwischenahn, F.R. Germany (5 Nov 1979).

US peat resources are the third largest in the world and are estimated to be about 1440 quads, equivalent to 240 billion barrels of crude oil. In the contiguous 48 states, peat deposits are generally located in areas with no other significant fossil fuel resources. Therefore, for those areas, peat represents an important source of energy. Peat conversion research at the Institute of Gas Technology (IGT) started in 1974 under sponsorship of the Minnesota Gas Company (Minnegasco). Since 1976, IGT has been working on a peat gasification program jointly funded by the US Department of Energy and Minnegasco. Systematic tests have been conducted in laboratory- and process development unit (PDU)-scale equipment to evaluate the conversion of peat to synthetic fuels. Tests have been conducted with peats from Minnesota, North Carolina, and Maine. The results show that, on the basis of chemistry, peat is a better raw material than coal from which to make substitute natural gas (SNG) as well as gasoline blending feedstock because a greater fraction of the feed carbon is converted to these products under milder operating conditions. Also compared with coal, peat conversion permits more flexibility in the relative yields of gas and liquid hydrocarbons. Peats from different regions could have different conversion and yield characteristics as demonstrated by tests on peats from Minnesota, North Carolina, and Maine. The estimates show that the economics of converting Minnesota peat (containing 50% moisture) to SNG by the IGT PEATGAS Process is competitive with those of converting Eastern US coal to SNG.

59131 **(NP-tr—2904694) Rapid pyrolysis of coal.** Loison, R.; Chauvin, R. Translated from *Chimie et Industrie (Paris)*; **91**: No. 3, 269-274(Mar 1964). 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82904694.

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Coal has been submitted to very fast heating (in the region of 1000°C/sec) by means of two apparatus: a vertical furnace in which a coal stream carried by gaseous nitrogen is heated by radiation from the furnace walls; and a filament furnace in which the coal particles are introduced into the mesh of a wire gauze heated by the Joule effect. The material balance of the pyrolysis for seven different grades of coal has been determined. The tar yield is a maximum (27%) for the bituminous coals having a carbon content in the region of 80%. The tar-gas ratio is much higher than that observed in vacuum pyrolysis. Specific conclusions can be drawn: (1) The total quantity of volatile materials is greater than that determined by the normal test method. This is a well known result; the quantity of volatile material increases with the rate of heating. But it is curious to note that the difference varies greatly between the different grades of coal: it is quite low for the poor quality coal and the two bituminous coals (containing more than 7% oxygen); on the other hand, it is very high for intermediate bituminous coals containing from 4 to 6% oxygen. (2) The proportion of tars is very high. Over the range of coals it passes a maximum for the Bruay coal whereas the proportion of gas, which is much lower, seems to increase regularly. Similar results were obtained in the radiant heating vertical furnace; we found, for example, a tar output of 18% (for pure coal) for the Faulquemont coal.

0106 Properties

REFER ALSO TO CITATION(S) 59110, 59126, 59127, 59154, 60087

59132 **(DOE/ET/10638—T1) Application of Diels-Alder reaction to coal fractionation. Final report.** Yen, T.F. (University of Southern California, Los Angeles (USA). School of Engineering). 1980. Contract FG01-77ET10638. 75p. NTIS, PC A04/MF A01. Order Number DE82016127.

The report consists in the fractionation with different organic solvents of coal, coal extracts and coal liquids of coal of different ranks and then the fractions are examined by infrared spectra nuclear magnetic resonance and electron spin resonance. The objectives are to find out how the different coal components are held together and to examine the feasibility of applying the Diels-Alder reaction to fractionating coal into useful raw materials. (LTN)

59133 **(DOE/PC/40783—T7) Instrumental methods of analysis of sulfur compounds in synfuel process streams. Quarterly technical progress report, April-June 1982.** Jordan, J.; Stahl, J.; Yakupkovic, J. (Pennsylvania State Univ., University Park (USA). Dept. of Chemistry). Jul 1982. Contract FG22-81PC40783. 19p. NTIS, PC A02/MF A01. Order Number DE82020949.

Task 1. The thermodynamics of competing reactions, which may interfere with the thermometric titration of polysulfides (with the reagent p-hydroxymercuribenzoate), were investigated. The crucial property is nucleophilic character (Lewis basicity) for which log K of the displacement of OH^- from HMB provides a convenient quantitative measure. The following sequence was found to prevail: S/sup =/ > CN^- > S_2O_3/sup =/ > OH^- = O > I^- > SO_3/sup =/ > NH_3 congruent to SCN^-. Task 2. Trith-

ionate, tetrathionate, pentathionate, and hexathionate yield well defined polarographic electroreduction waves at the dropping mercury electrode. Furthermore, tetrathionate, pentathionate and hexathionate were found to be electrooxidizable at glassy carbon anodes, while trithionate was not. Task 3. Inquiries have been sent to industrial, government, and academic organizations, soliciting appropriate specimens. Responses have been received from thirteen individuals, who have access to diverse samples in various locations, ranging from Washington and Oregon and California to New York, Delaware, and the Carolinas. A nitrogen dry-box facility has been readied for storing samples. A five-step protocol has been formulated for speciating and quantitating the major and minor moieties which contribute to the total sulfur content.

59134 **(DOE/PMTC—8(80)) Analyses of tipple and delivered samples of coal collected during Fiscal Year 1979. Report of investigations.** Welsh, R.A.; Janus, J.B. (Department of Energy, Pittsburgh, PA (USA). Pittsburgh Mining Technology Center). May 1980. 27p. NTIS, PC A03/MF A01. Order Number DE82021811.

This Department of Energy publication updates a series of Reports of Investigation on the quality of coal purchased under specifications for Government use. Listed in alphabetical order by state, county, town, and mine are analytical data on the composition and quality of tipple and delivered samples of coal collected during fiscal year 1979. Tipple samples were collected by a commercial laboratory under contract in accordance with instructions furnished by the Coal Sampling and Inspection Office. The delivered samples were collected at destination by installation personnel, and all samples were analyzed in the DOE laboratory located in Pittsburgh.

0108 Waste Management

59135 **(ARI-RR—275) Homogeneous production and removal of NO/sub x/ from combustion-exhaust flows. Final technical report, August 1, 1980-July 31, 1981.** Silver, J.A. (Aerodyne Research, Inc., Bedford, MA (USA). Center for Chemical and Environmental Physics). Oct 1981. Contract AC21-80MC14737. 52p. NTIS, PC A04/MF A01. Order Number DE82002463.

The addition of ammonia to the exhaust stream of stationary combustors is a promising approach toward reducing NO/sub x/ emissions. The use of high-sulfur-content fuels will produce moderate quantities of SO_2 and other sulfur-bearing compounds which may affect the effectiveness of this thermal deNO/sub x/ process. Modeling efforts indicate that the presence of SO_2 is slightly beneficial in removing NO above 1250°K. Experiments show that the ammonia-like species (NH/sub i/, i = 1, 2, 3) have no appreciable reaction rate with SO_2. However, the reactions of SO_2 with OH and SO_3 with H have a small effect on the chemistry. A chemical model which fully describes the deNO/sub x/ process and the effects of SO_2 is presented.

59136 **(DOE/FC/10120—6) Disposal of fly ash and fly ash alkali FGD waste in a western decoaled strip mine.** Groenewold, G.H.; Manz, O.E. (North Dakota Univ., Grand Forks (USA). Engineering Experiment Station). 20 May 1982. Contract AB18-80FC10120. 110p. NTIS, PC A06/MF A01. Order Number DE82021704.

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The potential impacts of fly ash and fly ash-generated FGD waste on groundwater quality by disposal in various surface mine settings is being evaluated by an ongoing study at the Center Mine near Center, North Dakota. Of concern is the generation and potential impact on groundwater of highly mineralized leachate characterized by very high concentrations of sodium and sulfate. Also of concern is the potential for generation of leachate characterized by elevated concentrations of certain toxic trace elements, particularly arsenic, selenium and molybdenum. The research involves detailed field studies and computational geochemical studies. The field study is evaluating two hydrogeologically distinctive types of disposal settings in the Center Mine: the pit bottom and the vee-notch between spoil ridges. This study has demonstrated that water in contact with both the fly ash and fly ash FGD waste is characterized by very high TDS concentrations. Predominate major species in solution are sodium, magnesium, calcium and sulfate. Sulfate concentrations in waste-effected groundwater are sufficiently high so that the water would be unfit to drink. Data from this project indicate that neither the fly ash nor the fly ash FGD waste from the Milton R. Young Plant constitute a hazardous waste as defined by RCRA regulations. Disposal in a pit-bottom position increases the potential for contact between the wastes and laterally migrating water in the base of the spoils and results in relatively slow, but continuous, dissolution of the waste material. Disposal in pit-bottom sites which contain standing water, due to groundwater inflow, will result in initial rapid dissolution, followed by relatively slow but continuous dissolution of the wastes. Vee-notch disposal sites are typically above the post-closure water table. The effect of evapotranspiration in semi-arid settings will be to minimize infiltration into vee-notch sites, thereby minimizing the potential for leachate generation.

59137 **(EPA—600/7-81-170) Economics of ash disposal at coal-fired power plants.** Kennedy, F.M.; Schroeder, A.C.; Veitch, J.D. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Energy Demonstrations and Technology). Oct 1981. 236p. (TVA/OP/EDT—81/34). NTIS, PC A11/MF A01. Order Number DE82906066.

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The comparative economics of utility ash disposal by five conceptual design variations of ponding and landfill were evaluated for a 500-MW power plant producing 5 million tons of ash over the life-of-project. For a basic pond disposal without water reuse, the total capital investment from hopper collection through one-mile sluicing and pond disposal is $52/kW (1982$). Comparable total system investment using trucking to a landfill is $30/kW. All disposal site construction costs were fully capitalized in both cases and this convention affects the comparison of annual revenue requirements. First-year annual revenue requirements for the ponding system are 1.85 mills/kWh (1984$), while those for the landfill system are lower at 1.66 mills/kWh. On the other hand, levelized annual revenue requirements are 2.26 mills/kWh and 2.42 mills/kWh respectively. Disposal site costs are the major element in all types of disposal and constituted the major difference in cost between pond and landfill disposal. Reuse of sluicing water and additional provisions for the disposal of self-hardening (high calcium oxide) ash added relatively little to costs.

59138 **(EUR—7621-DE) Energy production from waste with regard to the possibilities of high-grade insulating granulates for building material through the distension method.** Neumann, P. (Wirtschaft und Infrastruktur G.m.b.H. und Co. Planungs-KG, Muenchen (Germany, F.R.)). 1981. 107p. (In German). CEC, Information Market and Innovation, Luxembourg.

A study is made of the extent to which energy contained in residual materials can be released and be used for making concretes, based on waste products from industry, domestic and communal refuse as well as filings from the coal mining industry, flotation and screening plants, and coal-pit power plants. Also examined is the organic composition of the residue for residual energy release. The studies indicate that significant energy savings can be obtained by the release of residual energy of original raw material in the making of concretes. 14 figures, 6 tables.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 59120, 59136, 60155, 60159, 60202

59139 **(DOE/EV/02758—8) Strip mine reclamation: criteria and methods for measurement of revegetation success. Final report, June 1, 1975-September 30, 1982.** Carrel, J.E.; Kucera, C.L.; Harrison, A.P. Jr.; Johannsen, C.J.; Blanchar, R.W. (Missouri Univ., Columbia (USA)). Sep 1982. Contract AC02-76EV02758. 21p. NTIS, PC A02/MF A01. Order Number DE82020747.

During the contract period we conducted research aimed at answering the question: how can one judge whether surface coal mines have been reclaimed to acceptable levels of plant productivity. We focused on finding suitable methods and criteria for deter-

mining revegetation success in Midwestern minelands. We tested both direct and remote sensing techniques for measuring plant ground cover, production, and species composition. We worked in old abandoned mines in Missouri and newly reclaimed mines in Missouri, Illinois and Kansas. We also looked at plant decomposition and microbial activity in spoil materials. We conclude that direct, ground level measurements are necessary to obtain statistically valid data on plant performance, but remote sensing information provides valuable documentation of landscape features. Furthermore, from our data we infer that crops and soils in newly reclaimed strip mines often are as good as or better than those in unmined reference fields.

59140 **(DOE/EV/10244—5) Field-flow fractionation in the analysis of energy-related materials. Technical progress report.** (Utah Univ., Salt Lake City (USA)). 1982. Contract AC02-79EV10244. 23p. NTIS, PC A02/MF A01. Order Number DE82020388.

During the contract period nine articles have been prepared and submitted for publication. Specific progress is described in the following four areas: basic particle characterization; water quality and energy development; airborne particulates; and coal liquids and fine ground coal.

59141 **(ORNL/TM—8439) Technique for analyzing sulfur dioxide concentrations from multiple randomly-varying sources.** Witten, A.J.; Kornegay, F.C.; Long, E.C. Jr.; Molyneux, J.E.; Tevepaugh, J.A. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 40p. NTIS, PC A03/MF A01. Order Number DE82020490.

A technique for realistic prediction of violations of air quality standards from multiple emission sources is presented. The method allows the sulfur dioxide (SO_2) emission rates to vary randomly and thus incorporates the emissions variability that does occur as a result of the variability in the sulfur content of coal and the general variability in power plant operations. A modified version of the RAM model is utilized as the basic dispersion model in this technique. The RAM results are statistically analyzed using a cumulative distribution function for the source strengths to predict the potential for violations of predetermined air quality standards. Using representative plant input characteristics, actual meteorological data, and estimates of sulfur content in the coal used by 30 sources, probabilities of no, one, and more than one excursion of varying levels of SO_2 increase are calculated. The effectiveness of emission control strategies in reducing the probability of SO_2 violations is also examined. Regulatory acceptance of this technique would allow a regulatory agency to examine objectively the potential air quality impacts of a proposed action, and the effectiveness of varying levels of pollution control to be examined and would allow a plant operator to choose the preferred combination of sulfur content mean and variability along with the necessary level of sulfur control to comply with air quality regulations.

59142 **(PB—82-196858) Environmental assessment: source test and evaluation report--Exxon miniplant pressurized fluidized-bed combustor with sorbent regeneration. Final report May 79-Jul 80.** Kindya, R.J.; Hall, R.R.; Hunt, G.; Piispanen, W.; Fennelly, P. (GCA Corp., Bedford, MA (USA). GCA Technology Div.). Apr 1981. 216p. NTIS, PC A10/MF A01.

The report gives results of a comprehensive emission sampling and analysis of the EPA-sponsored, Exxon Miniplant, pressurized, coal-fired, fluidized-bed combustor (PFBC) and sorbent regeneration system. Air pollutant emissions of seven trace elements exceeded emissions goals in the PFBC flue gas, indicating a need for further study. Air pollutant emissions of total organics were less than for comparable conventional combustion systems. Limited further analyses for specific polynuclear aromatic compounds indicated that emissions of one of these compounds exceeded its emissions goal. Laboratory-generated leachates from solid waste samples resulted in trace metal concentrations well below Federal hazardous waste criteria. Positive test results for mutagenicity and cytotoxicity screening tests on flue gas samples require further study.

59143 **(PB—82-197153) Development of criteria for extension of applicability of low-emission, high-efficiency coal burners. Annual report No. 3, Oct 79-Oct 80.** Nurick, W.; Payne, R.; Lee, J.; Case, P.; Chen, S. (Energy and Environmental Research Corp., Santa Ana, CA (USA)). Oct 1981. 202p. NTIS, PC A10/MF A01.

The report describes the third year's efforts in a program to develop criteria for extending the applicability of low-emission, high-efficiency coal burners. For the small-scale fuel studies, 28 coals covering all ranks were tested under a wide variety of conditions to ascertain the impact of coal properties on the fate of fuel nitrogen (N). Significant accomplishments in this part of the program include: (1) bench-scale test results confirm the pilot-scale concept that decreasing the initial air/fuel ratio decreases fuel NOx formation; (2) detailed studies on optimizing a staged combustion system suggest that the stoichiometry producing minimum NOx emissions is a function of both fuel composition and primary-zone conditions; (3) distribution of the total fixed nitrogen (TFN) species--NO, NH_3, and HCN--leaving the first stage is strongly dependent on coal composition; (4) distribution of the first-stage fuel N emissions has a significant impact on second-stage exhaust NO emissions (minimum second-stage NO emissions depend on competition between first-stage NO and increased gas - and solid-phase N species); and (5) during staged combustion, increasing the rate of heat extraction from the first stage (fuel-rich zone) decreases the decay of TFN species, but dramatically decreases TFN conversion in the second stage (first-stage extraction reduces exhaust NO emissions).

59144 **(PNL—4222) Terrestrial fate of coal-liquid constituents: behavior of alkyl anilines in soil.** Felice, L.J.; Zachara, J.M.; Rogers, J.E. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1982. Contract AC06-76RL01830. 44p. NTIS, PC A03/MF A01. Order Number DE82021708.

The low molecular weight aromatic amines (anilines) are important water soluble constituents of coal liquids. The impact of anilines released to the terrestrial environment will largely depend on their mobility and persistence. Studies were conducted to investigate those processes governing the mobility and persistence of the alkylanilines, namely, soil sorption and chemical/microbial degradation. Soil sorption measurements were conducted on aniline and several methyl substituted anilines on A and B horizons of a soil profile collected from Davies County, Kentucky. The magnitude of sorption was large in all horizons. Sorption in the B horizons was larger than in the A horizon for many of the anilines studied, indicating the importance of both the mineral matrix and organic carbon content of the soil in determining the magnitude of sorption. Results of these measurements indicate that movement of the anilines through the soil would be significantly attenuated by sorption reactions. Aniline sorption measurement in the A horizon after removal of the organic matter and in the B_{22} horizon after removal of amorphous iron oxides and crystalline iron oxides indicate that organic matter largely controls aniline sorption in the A horizon, while crystalline iron oxides and phyllosilicates are important in the B horizons. The effects of pH on aniline sorption was also examined and shown to have significant effects on the magnitude of sorption in both A and B horizons. Soil degradation studies using ^{14}C-3-methylaniline as a model for alkyl aniline degradation show that 3-methylaniline is readily metabolized by soil microorganisms during the 32-day period examined.

0110 Reserves And Exploration

59145 **(USGS-OFR—81-563) Guide for the calculation of coal resources using the computer program GARNET.** Crowley, S.S.; Medlin, A.L.; Smith, R.J. (Geological Survey, Washington, DC (USA)). 1981. 36p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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GARNET (Graphic Analysis of Resources using Numerical Evaluation Techniques) is a system developed by the National Coal Resources Data System (NCRDS). Through the invocation of approximately 20 commands, the user can create contour plots at specified map scales, calculate coal resource tonnages for a given

area, edit data and add interpretive point data. GARNET is used in conjunction with PACER, the retrieval system which accesses NRCDS data bases. The user retrieves relevant data from the data base of interest (USTRAT, USCHEM, etc.), then runs the data through the auxiliary program called VLATLONG. Once these steps are completed, the user may utilize the GARNET system. GARNET is currently installed on the Honeywell/Multics 68/80 computer at the US Geological Survey (USGS) in Reston, Virginia. It is designed primarily for interactive usage, i.e., the user is prompted for commands and parameters while the program is running. However, many of the commands and operations can be accomplished in a batch mode by an experienced GARNET user to reduce costs. This manual is intended for the user who has had at least the Introduction to Multics course or equivalent experience.

0120 Mining

REFER ALSO TO CITATION(S) 59194, 59232

59146 **(DOE/ET/12581—T1) Demonstration of new high-performance batteries in coal-mining scoops. Final technical report.** Rosey, R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). Mar 1982. Contract AC01-76ET12581. 139p. NTIS, PC A07/MF A01. Order Number DE82020535.

Portions of document are illegible.

The program objective was to demonstrate the performance features of an improved battery system in underground coal haulage applications that might increase productivity for the equipment and lower operating costs for the mine operator. The program was initiated with an investigation of several mine facilities to evaluate the operation of battery powered coal haulers. A design concept and specification for the nickel-iron battery was developed for use in a S and S Corporation CX-2 UNATRAC Coal Hauler. An 800 Ah, 132 VDC nickel-iron battery system was assembled and tested. Field tests were conducted at an aboveground test track to simulate actual mining environments. Test results indicated that the nickel-iron battery could provide a range of 40 to 70% additional trips per battery charge cycle. Auxiliary hardware functioned as designed and demonstrated the automatic battery maintenance features. A relatively high number of cell package failures occurred during this test period that precluded an underground demonstration. As a result of the performance improvements demonstrated by the battery and the potential for an additional increase in performance due to recent advancements in electrode technology, the final phase of the program was redirected to design and test additional prototype cells addressing the packaging problems encountered during the field test period. The increased energy storage and high rate charging for the nickel-iron system does provide the mine operator with more options on operating the equipment within a section by extending the useful service time of the battery for a shift or multiple shift operation.

59147 **(PB—82-109901) Coal-Cooperative Efficiency Program: small-mine operations. Final report.** Multcher, J. (Berger Associates, Harrisburg, PA (USA)). Sep 1980. 315p. (ARC—77-203-5897). NTIS.

Portions of document are illegible.

This study researched the concept of small coal operators combining to form coal cooperatives as a means of providing services and to improve their economic position in coal markets. A small coal operators attitude survey was completed in Appalachia, along with actual interviews of numerous operators in two case study areas - Clearfield, Pennsylvania, and Beckley, West Virginia. A profile of small operator facilities and operations was developed along with suggested coal cooperative configurations in the two case study areas. A general administrative services co-op was suggested for the Beckley area and a capital intensive coal processing/transloading co-op for the Clearfield area. From a review of the vast experience in US agricultural cooperatives a step-by-step procedure for forming a coal co-op is detailed from the idea stage to the first Board of Director's meeting. An extensive economic analysis is included to demonstrate potential member benefit-costs. Recommendations are made to operator, state, regional and federal sectors to develop demonstration coal cooperatives to further prove out the concept.

59148 **(PB—82-183104) Real-time precalculation of the distribution of combustion products and other contaminants in the ventilation system of mines. Open file report 1 Jun 79-15 Mar 81.** Greuer, R.E. (Michigan Technological Univ., Houghton (USA)). Mar 1981. 264p. NTIS, PC A12/MF A01.

Two computer programs for the real-time calculation of concentration distributions in the ventilation system of underground mines were designed. The programs allow simulation of the movement of fumes or other contaminants with the ventilating air, the calculation of concentrations at any given time and location, and the determination of the total contaminant exposure at different places in the mine. Multiple and time variable contaminant sources can be handled and recirculation is no obstacle. The first program is based on an airflow distribution which has, in the input data, to be stated. The second program has been linked to an existing program for the calculation of airflow distributions. Two versions of the second program are provided to accommodate the two existing programs. Several executed examples demonstrate the program performance.

59149 **(PB—82-183112) Fugitive dust study of an open pit coal mine. Open file report Jun 79-Sep 80.** Marple, V.; Rubow, K.; Lantto, O. (Minnesota Univ., Minneapolis (USA). Particle Technology Lab.). Sep 1980. 150p. NTIS, PC A07/MF A01.

In 1979 the University of Minnesota Mobile Laboratory (UMML), designed for the analysis of airborne particles and gases, was used to study fugitive dust from an open pit coal mine. The analysis consisted of determining the particle size distribution and concentration of dust from various mining operations such as blasting, draglines, loading, roadways, and bottom scrapers. For some operations the particles size distribution and concentrations were determined at varying distances. Details of the dust concentration within the plumes as the plume passed the UMML were measured with an optical particle counter. For line sources, such as roadways, these measurements enabled the calculation of the particle flux at the sampling location. In addition to the standard instruments associated with the UMML, the applicability of some new instruments was investigated. These included a uniform deposit cascade impactor and a flux meter. Finally, a technique in identifying plume origins that utilize elemental X-ray fluorescence analysis of filter samples was shown to be effective.

59150 **(PB—82-188137) Coal seam exploration with special regard to the application of seismic methods for the detection of dykes.** Merten, W.N.; Vreede, F.A. (Council for Scientific and Industrial Research, Pretoria (South Africa). National Mechanical Engineering Research Inst.). Jul 1981. 16p. NTIS, PC A02/MF A01.

This report proposes the application of in-seam methods for coal seam exploration in connection with longwall mining. The present exploration practice is reviewed and it is shown that with the introduction of the relatively expensive high production longwall mining technique, in-seam seismic methods have become important to successful mining operations. The basics of relevant seismic methods are described and the outline is given along which research is to be conducted. As first step of this research, a program directed at the detection of dikes is presented.

0130 Transport And Handling

59151 **(DOE/EIA/02295—T1) Magnetite recovery in coal washing by high-gradient magnetic separation. Quarterly project status report, 12th quarter.** (Massachusetts Inst. of Tech., Cambridge (USA). Francis Bitter National Magnet Lab.). 1982. Contract AM01-76EI02295. 6p. NTIS, PC A02/MF A01. Order Number DE82020395.

We have concentrated on running the 1.85 m carousel separator during this quarter. Some equipment refinements and personnel changes have contributed to very satisfactory results especially in coal entrainment and the ability to run at high slurry density. The carousel appears to be operating satisfactorily in its present configuration. Modification to the pole pieces, while they would help a great deal, would interrupt the program for at least several

months. A new feed system has made such modifications unnecessary for the moment and we are now able to define the rest of the program to be performed under the present contract. About 35 runs have been made up to now with 40 more now scheduled.

59152 **(DOE/NBM—2020246) Transport characteristics of alternate supply fuels. Quarterly technical report, April-June 1982.** Joubert, J.I. (Department of Energy, Pittsburgh, PA (USA). Pittsburgh Energy Technology Center). 1982. 13p. NTIS, PC A02/MF A01. Order Number DE82020246.

The test series examining the effect of particle size distribution on flow properties was completed. Three separate coal particle size distributions were prepared. These three distributions were specified as nominally 85% passing 200 mesh, 70% passing 200 mesh and 50% passing 200 mesh. Tables 1, 2 and 3 present particle size data typical of each distribution. The distributions presented in each table cover the range of distributions measured for the raw coal and samples of each CWM before and after flow tests. The data presented account for essentially all of the mass in each sample; however, the analytic method does not count the number of small particles. Twenty-four flow tests were run in both loops covering coal concentrations of 0% coal, 55% coal (+- 1.5%), 60% coal (+- 1.5%), 65% coal (+- 1.5%), 67.5% coal (+- .5%) and 70.3% coal. For the one-inch loop mass flow rates ranged from 19 lb/min to 145 lb/min (shear rates from approximately 65 sec^{-1} to 600 sec^{-1}). For the two inch loop, mass flow rates ranged from 70 lb/min to 520 lb/min (shear rates from approximately 45 sec^{-1} to 300 sec^{-1}). Table 5 lists the actual tests including the range of mass flow rates and the average system temperature. In general, the results of the flow tests indicated that the coarser particle size distributions yielded CWM's having greater fluidity. The mass flow rates isted for the 67.5% coal CWM's in the two-inch loop indicate that as the average particle size increased, higher mass flow rates could be obtained (356 lb/min up to 518 lb/min) at this high coal concentration without exceeding the pressure limit set on the pump discharge.

0140 Combustion

REFER ALSO TO CITATION(S) 59141, 59142, 59462, 59959, 59960, 59961

59153 **(DOE/PC/30294—7) Pulverized fuel combustion: modeling and scaleup methodologies. Seventh quarterly report, April 1, 1982-June 30, 1982.** Lewis, P.F.; Kemp, N.H.; Cronin, J.F. (Physical Sciences, Inc., Andover, MA (USA)). 1982. Contract AC22-80PC30294. 13p. (PSI-TR—338). NTIS, PC A02/MF A01. Order Number DE82019340.

During the past quarter we have begun to perform comparisons of the mixing model discussed in the last quarterly report with non-reacting flow data. These comparisons, although not perfect appear to be satisfactory. Further comparisons are in progress. The revised chemical model discussed in the previous quarterlies has been tested and compared with previous results. These comparisons indicate that the reactions of hydroxyl radicals and oxygen atoms with coal chars are not important for describing the combustor performance. Further testing of the effects of these reactions will be performed; however, the indication is that these reactions should be removed to streamline the model.

59154 **(DOE/PC/40285—T4) Program of basic research on the utilization of coal-water mixture fuels. Quarterly report for the period ending July 31, 1982.** Casassa, E.Z.; Padmanaban, J.; Parfitt, G.D.; Phulgaonkar, S.; Rao, S.A.; Rubin, E.S.; Sommer, H.T.; Toor, E.W. (USDOE Pittsburgh Energy Technology Center, PA; Carnegie-Mellon Univ., Pittsburgh, PA (USA). Center for Energy and Environmental Studies). 1982. Contract FG22-81PC40285. 92p. NTIS, PC A05/MF A01. Order Number DE82020104.

The period covered by this report was devoted mainly to characterization of slurries of Pittsburgh Seam No. 8 coal by sedimentation, rheology and electrophoretic mobility determinations. Tasks 1 through 4 are largely completed, except that task 2 (properties of coal samples) must be repeated for each new coal studied, as must task 5 (characterization of slurries). The work reported here is a continuation of studies on electrophoresis, rheology and sedimentation of Pittsburgh Seam No. 8 in aqueous slurries, along with further data on surface areas of fractions of that coal and wettability as measured by the Walker test.

59155 **Method of producing a colloidal fuel from coal and a heavy petroleum fraction.** Longanbach, J.R. (to Dept. of Energy). US Patent Application 321,346. 13 Nov 1981. 12p. Contract AC01-79ER10062.

A method is provided for combining coal as a colloidal suspension within a heavy petroleum fraction. The coal is broken to a medium particle size and is formed into a slurry with a heavy petroleum fraction such as a decanted oil having a boiling point of about 300 to 550°C. The slurry is heated to a temperature of 400 to 500°C for a limited time of only about 1 to 5 minutes before cooling to a temperature of less than 300°C. During this limited contact time at elevated temperature the slurry can be contacted with hydrogen gas to promote conversion. The liquid phase containing dispersed coal solids is filtered from the residual solids and recovered for use as a fuel or feed stock for other processes. The residual solids containing some carbonaceous material are further processed to provide hydrogen gas and heat for use as required in this process.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 59173, 59194

59156 **(METC—82-25) Study of US coal resources, markets, and transportation.** (Zawadzki (Edward A.) Ltd., McMurray, PA (USA)). Dec 1981. Contract AC21-81MC16331. 72p. NTIS, PC A04/MF A01. Order Number DE82020908.

The purpose of this study is to review past work on the feasibility of attaining projections of coal production and use and to develop answers to the following questions: (1) are projected proven coal reserves adequate to sustain projected mine expansions and the continued high level of coal usage; (2) when and where will coal mining capacity be expanded to produce future coal supplies; (3) which markets will utilize the increasing coal production; and (4) will the transportation network be adequate to move this increased production to the consumer. Results indicate that: the United States coal reserve base is adequate to meet energy needs for the next 300 to 400 years at current production levels; coal production will double by the year 2000 due to significant growth in utility and industrial coal consumption; a significant part of the growth of electric utility coal consumption during the next 20 years will occur in regions of the country now utilizing relatively small quantities of coal; new coal production will be concentrated in the Western States; transportation is not a barrier to the development of an annual coal production double that of current production; until construction of new port coal loading facilities are completed, existing coal terminal loading facilities may have insufficient capacity to meet demand; and production of coal for the synthetic fuels industry is expected to be significant in the future. (DMC)

0160 Health And Safety

REFER ALSO TO CITATION(S) 59149, 59219

0170 Legislation And Regulations

REFER ALSO TO CITATION(S) 59656

02 PETROLEUM

0201 Reserves

59157 **(USGS-OFR—81-1142) Assessment of conventionally recoverable petroleum resources of Indonesia.** Masters, C.D.; Riva, J.P. Jr. (Geological Survey, Washington, DC (USA)). 1981. 8p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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This report is a product of the World Energy Resources Program of the US Geological Survey (USGS). The program is designed to prepare geologically based resource assessments of the potential petroleum basins of the world. In this report, the locations of the Indonesian basins are shown and unconditional estimates by the USGS of oil and gas resources in these basins are given. Data supporting these estimates are tabulated.

59158 **(USGS-OFR—82-34) Estimated oil and gas reserves, Gulf of Mexico Outer Continental Shelf and Continental Slope, December 31, 1981.** Hewitt, J.E.; Brooke, J.P.; Knipmeyer, J.H.; Surcouf, R.M. (Geological Survey, Washington, DC (USA)). 1982. 17p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

Remaining recoverable reserves of oil and gas in the Gulf of Mexico Outer Continental Shelf and Continental Slope have been estimated to be about 2.90 billion barrels of oil and 39.8 trillion cubic feet of gas, as of December 31, 1981. These reserves are recoverable from 445 studied fields under the federal submerged lands off the coasts of Louisiana and Texas. An additional 44 fields, discovered since December 31, 1979, have not been sufficiently developed to permit a reasonably accurate estimate of reserves. Original recoverable reserves are estimated to have been 8.17 billion barrels of oil and 93.4 trillion cubic feet of gas from 461 fields in the same geographic area. Included in this number are 16 fields that are depleted and were abandoned; not included are the 44 insufficiently developed fields. Estimates were made for individual reservoirs in 355 fields and on a field-wide basis for the other 106 fields.

0202 Geology And Exploration

59159 **(USGS-OFR—81-84A) Oil and gas resource-assessment areas: Alaska Regions 1 and 1 A.** Varnes, K.L.; Dolton, G.L.; McMullin, R.H. (comps.). (Geological Survey, Washington, DC (USA)). 1980. 25p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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59160 **(USGS-OFR—81-84B) Oil and gas resource assessment areas: Pacific Coast Regions 2 onshore and 2A offshore.** Varnes, K.L.; Dolton, G.L.; Scott, E.W. (comps.). (Geological Survey, Washington, DC (USA)). 1980. 10p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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59161 **(USGS-OFR—81-84C) Oil and gas resource assessment areas: lower 48 United States Regions 2 through 11, 2A, 6A, and 11A.** Varnes, K.L.; Coury, A.B.; Dolton, G.L.; Frezon, S.E.; Khan, A.S.; Pike, R.S.; Powers, R.B.; Scott, E.W. (comps.). (Geological Survey, Washington, DC (USA)). 1980. 16p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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59162 **(USGS-OFR—81-667) Map showing evaluation of oil and gas potential of the Shoshone National Forest, Wyoming.** Spencer, C.W.; Dersch, J.S. (Geological Survey, Washington, DC (USA); Forest Service, Washington, DC (USA)). 1981. 12p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

59163 **(USGS-OFR—81-1171) Availability of cores and cuttings and petrographic thin-sections from the Ellesmerian strata of 16 test wells of National Petroleum Reserve in Alaska .** Bowsher, A.L.; Tailleur, I.L. (Geological Survey, Washington, DC (USA)). 1981. 6p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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This report announces that cores and cuttings from wells drilled in the exploration of the National Petroleum Reserve in Alaska are available to the public for non-destructive analysis at the cold storage facility. A set of 99 thin-sections for 16 wells can be borrowed for off-site study for a period of three weeks. (DMC)

0203 Drilling And Production

59164 **(DOE/BC/10079—48) Experimental determination of solids friction factors and minimum volumetric requirements in foam and mist drilling and well-cleanout operations. Final report.** Okpobiri, G.A.; Ikoku, C.U. (Tulsa Univ., OK (USA)). Sep 1982. Contract AC19-79BC10079. 352p. NTIS, PC A16/MF A01. Order Number DE82020945.

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In order to accurately predict minimum air and liquid volumetric requirements for foam drilling operations, the frictional losses due to the solid phase and the settling velocities of such solids must be taken into account. To adequately account for pressure drop across the bits, a new equation which takes the compressibility of foam into consideration is required. Thus, the objectives of this study are: (a) to present a semi-empirical model for predicting frictional losses due to the solid phase in solids-foam slurry flow, (b) to develop a theoretical model for predicting pressure drops across bits for foam, and (c) to utilize these models to predict minimum volumetric requirements for foam drilling operations, taking into consideration the settling velocities of drilled particles. A theoretical model for predicting pressure drop across bit nozzles for foam and mist flows is proposed. It accounts for the compressibility of foams but assumes negligible pressure losses due to friction and changes in elevation. Semi-empirical correlations for predicting friction factor due to solids and suspension are presented for sandstone and limestone particles. A realistic model has been developed for predicting minimum volumetric requirements for foam and mist drilling operations. It accounts for frictional losses due to the solid phase, pressure drop across nozzles and particle settling velocities. The technique offers a high degree of flexibility in the selection of wellhead injection pressures and volumetric requirements. Actual field application of this work can be accomplished by two different methods depending on compressor specifications. These are the variable back pressure and constant back pressure schedules. They are primarily graphical.

59165 **(DOE/BC/10326—4) Effect of pressure, time and composition on oil-water surfactant systems for tertiary oil recovery. First annual report, October 1, 1980 to September 30, 1981.** Good, R.J. (State Univ. of New York, Buffalo (USA). Dept. of Chemical Engineering). Aug 1982. Contract AS19-80BC10326. 56p. NTIS, PC A04/MF A01. Order Number DE82021664.

Measurements have been made of interfacial tension, γ, as a function of pressure, with oil-water-surfactant systems that are relevant to enhanced oil recovery (EOR) by surfactant flooding. The pressure coefficient of γ, at constant composition, is positive in every case examined. In this behavior, interfaces in surfactant systems differ strongly from interfaces that are free from surfactant. The interfacial behavior is complicated by the change in solubility relations with increase in pressure, and consequent mass transfer effects. A theory is being developed, that relates the interfacial tension (IFT) in a nonequilibrium system to the rate of mass transfer across the interface. It shows promise of explaining the changes of IFT that we are observing, with changes in pressure.

59166 **(DOE/BETC—82/2) Contracts for field projects and supporting research on enhanced oil recovery and improved drilling technology. Progress review No. 30, quarter ending March 31, 1982.** Linville, B. (ed.). (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). Jul 1982. 147p. NTIS, PC A07/MF A01. Order Number DE82021689.

Reports are presented of contracts for field projects and supporting research on chemical flooding, carbon dioxide injection, thermal/heavy oil, as well as for the following areas of research: resource assessment technology; extraction technology; microbial

enhanced oil recovery; improved drilling technology, and general supporting research.

59167 (DOE/ET/12056—22) Laboratory combustion-tube studies. Final report. Fassihi, M.R.; Ramey, H.J. Jr.; Brigham, W.E. (Stanford Univ., CA (USA). Petroleum Research Inst.). Aug 1982. Contract AC03-76ET12056. 95p. NTIS, PC A05/MF A01. Order Number DE82021657.

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The importance of various process variables was assessed through regular combustion tube runs using four different crude oils. Following Gates and Ramey, the correlation of Oil Recovered-Volume Burned was found to be an effective tool in prediction of combustion tube oil recovery. Hence, the range of applicability of this correlation was extended to higher gas saturations. To study the fuel availability and the frontal behavior more closely, some runs in heterogeneous packs were conducted using two or three consecutive zones of oil sand and water sand. It was found that distillation dominates the fuel deposition reaction. The method for measurement of burning front thickness is also discussed. 45 figures, 19 tables.

59168 (DOE/ET/12056—31) Transient-pressure analysis in composite reservoirs. Tang, R.W.K. (Stanford Univ., CA (USA). Petroleum Research Inst.). Aug 1982. Contract AC03-76ET12056. 131p. NTIS, PC A07/MF A01. Order Number DE82021604.

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This study deals with the problem of fluid flow in a radially composite reservoir. Recently, A. Satman, et al [Satman, A., Eggenschwiler, M., and Ramey, H.J. Jr.: Interpretation of Injection Well Pressure Transient Data in Thermal Oil Recovery, SPE 8908, presented at the 50th Annual California Regional Meeting, SPE of AIME, Los Angeles, California, April 9-11, 1980] published the most general analytical solution available thus far. That analytical solution is analyzed in this study, and the new results are presented. The solution is dependent on four dimensionless parameters, if wellbore storage and skin effect are neglected; they are, dimensionless time based on the discontinuity radius, the dimensionless discontinuity radius, the mobility ratio and the diffusivity ratio. The range of parameters used in generating the results include dimensionless radius time of 0.01 to 10,000, mobility ratio of 1 to 1000 and diffusivity ratio of 1 to 200. The results were analyzed graphically and numerically. In general, the results feature an infinite acting period followed by a transition period before the start of the second infinite acting period. The first and second semi-log straight lines reflect the parameters of regions behind and ahead of the discontinuity. The length of the transition period is dependent on the mobility ratio, diffusivity ratio and discontinuity radius. The results were also compared to previously published results.

59169 (DOE/ET/12056—34) SUPRI heavy-oil research program. Fifth annual report, October 1, 1980-September 30, 1981. Brigham, W.E. (Stanford Univ., CA (USA). Petroleum Research Inst.). Aug 1982. Contract AC03-76ET12056. 152p. NTIS, PC A08/MF A01. Order Number DE82021660.

This report summarizes the work done in five areas: reservoir properties (permeability), in-situ combustion, additives to improve steam injection, well-to-well formation evaluation, and field support services. (DLC)

59170 (DOE/ET/12082—8) Simulation of the one-dimensional convection of four-phase, four-component mixtures. Topical report, June 1980. Orr, F.M. Jr. (New Mexico Inst. of Mining and Technology, Socorro (USA). New Mexico Petroleum Recovery Research Center). Oct 1980. Contract AS21-78ET12082. 135p. NTIS, PC A07/MF A01. Order Number DE82021827.

This report describes a one-dimensional process simulator designed for carbon dioxide (CO_2) flooding applications, though much of the code is equally applicable to surfactant flooding simulations. The simulator, CO2FLD, follows convection of four components. Three components enter into phase equilibrium calculations for up to three phases containing hydrocarbons and CO_2. The fourth component is water which appears only in a separate phase. Material balance equations for the four components are solved by a fully explicit finite difference method which allows the use of numerical dispersion to simulate the effect of physical dispersion, which is not modeled explicitly. Section 2 of the report contains a description of the formulation of the model; section 3 summarizes the representations of phase behavior; and section 4 outlines fluid property and relative permeability models used in the simulator. Section 5 compares numerical solutions to analytic solutions for simple cases. Input data formats are described in Appendix A. The use of routines for automatic plotting of run results is detailed in Appendix B. Appendix C is a description of a simple least squares program for selecting parameters for representing a binodal curve based on experimental data. Appendix D contains listings of CO2FLD, associated plotting routines and the routine for determining binodal curve parameters in addition to a brief description of each subroutine in the various programs.

59171 (DOE/ET/12382—11) Correlation of petroleum component properties for improved waterflooding. Final report. Yen, T.F. (University of Southern California, Los Angeles (USA). School of Engineering). Aug 1982. Contract AS19-78ET12382. 114p. NTIS, PC A06/MF A01. Order Number DE82021610.

The objective of this work was to understand the mechanisms involved in lowering the interfacial tension of acid-containing hydrocarbons in water by alkali agents. In order to do this, the composition and chemical properties of three crude oils were studied. The alkali sensitive interfacially active fractions of these crude oils were characterized and an equilibrium chemical model for the observed interfacial phenomena was developed. The results of the experiments allow the following conclusions to be drawn: (1) the alkali sensitive surface active components of crude oil can be concentrated into a small polar fraction using silica gel column chromatography. These active components are primarily carboxylic acids. (2) The presence of sodium chloride in the alkaline aqueous solution can lower the alkali concentration required to bring about the drop in interfacial tension between oil and water. Increased salt concentration, however, causes an overall higher interfacial tension. (3) An equilibrium chemical model was proposed expressing the interfacial concentration of active acids. (4) The active acids present in the crude are shown to be a mixture of many species which ionize at different bulk solution pH. Therefore sequential flooding with solutions of different alkali concentrations is proposed to react with these different species. (5) It is possible to generate additional soap forming acids from the crude by treating the crude with dilute solutions of mineral acids such as hydrochloric acid or sulfuric acid.

59172 (DOE/MC/10689—11) Development of mobility control methods to improve oil recovery by CO_2. Second annual report, October 1, 1980-September 30, 1981. Heller, J.P.; Taber, J.J. (New Mexico Inst. of Mining and Technology, Socorro (USA). New Mexico Petroleum Recovery Research Center). Aug 1982. Contract AC21-79MC10689. 91p. NTIS, PC A05/MF A01. Order Number DE82021658.

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The goal of this project has been to develop methods to counteract the harmful influence of the naturally unfavorable mobility ratio in CO_2 floods. Our efforts have been directed towards the development of two distinct methods for increasing the effective viscosity of dense CO_2. One of these involves the use of water-CO_2 emulsions or foams as the displacement fluid. The second type of mobility control additives being investigated are direct thickeners - solutions of certain polymers in the CO_2. Significant progress has been made in both these areas of development. In conjunction with the development of means of thickening the CO_2 displacement fluid, the need also exists to assess the behavior and effectiveness of the additives. The assessment is to be performed in a standardized, repeatable core-flooding test which has been developed as a third part of the project's laboratory work. As with the development of the thickeners themselves, good progress has also been made here, and the experimental and measuring system has been brought to operating condition.

0206 Health And Safety

REFER ALSO TO CITATION(S) 59219

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 59176, 59177

59173 **(DOE/CS/30013—U9) Rate guide for residential No. 2 heating oil and coal.** Clayton, M. (Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center). 1982. Contract FG01-79CS30013. 290p. NTIS, PC A13/MF A01. Order Number DE82020564.

This document gives the prices for No. 2 heating oil and coal for each city in the SOLCOST Data Bank. It shows the name of one company chosen at random in each city. The name is shown so as not to misrepresent any other companies. The information shown represents the data as quoted by each company. This includes the basic rate, the taxes, and the delivery charge, if not included. The minimum represents the minimum amount sold to any one customer. Calculations have been made to show cost per gallon of fuel oil, cost per ton of coal, cost for both commodities with taxes, and cost-per-million Btu. Efficiency factors are not considered. The reader must apply the efficiency factor that is pertinent to his particular furnace, stove or fireplace. The Btu values used in converting to cost-per-million Btu are 136,000 Btu per gallon of No. 2 heating oil and 25,070 Btu for a ton of coal. These values have been taken from the DOE/EIA Monthly Energy Review for August 1980 and will vary from city to city.

59174 **(PB—82-190141) Alaska OCS socioeconomic studies program. Technical report number 59. St. George basin petroleum development scenarios: local socioeconomic systems analysis. Final report.** Smythe, G. (Alaska Consultants, Inc., Anchorage (USA)). May 1981. 446p. NTIS, PC A19/MF A01.

This report includes detailed community baseline data about Unalaska, Cold Bay, and St. Paul. It also projects and analyzes how the infrastructure of these towns could be affected by future growth without the proposed St. George Basin OCS Lease Sale No. 70. For Unalaska, possible impacts of OCS activity under an 'exploration only' and a 'mean' petroleum development scenario are also analyzed. The primary objective of these analyses is to determine the local amenities and services which would logically be most impacted without OCS Lease Sale No. 70 and, in the case of Unalaska, additional impacts which could be expected under conditions of offshore oil and gas development.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 59176, 59797, 60155

59175 **(PB—82-197773) Ixtoc oil spill assessment: executive summary. Final report.** Boehm, P. (Energy Resources Co., Inc., Cambridge, MA (USA)). Apr 1982. 41p. NTIS, PC A03/MF A01.

The Ixtoc I oil well blowout in the Bay of Campeche resulted in the largest documented spill in history. Approximately half a million metric tons of oil were released into the marine environment from June 1979 to March 1980, with an unknown quantity of oil impacting the northwest Gulf of Mexico shelf. This study was undertaken to establish the effects of residues of Ixtoc oil on the inner shelf. During the study the Burmah Agate oil tanker spilled part of its cargo of light crude oil following a collision off Galveston, Texas. A suite of chemical analytical techniques was employed successfully to firmly establish the range of compositions of Ixtoc and Burmah Agate oils which might be encountered in sediments and animal tissue.

0210 Legislation And Regulation

REFER ALSO TO CITATION(S) 59232

0220 Transport, Pipelines, And Handling

59176 **(PB—82-187485) Alaska OCS socioeconomic studies program. Technical report number 65. Beaufort Sea transportation systems anlaysis: transportation baseline update and forecast of conditions without the planned lease sale, Beaufort Sea (71). Final technical report.** Eakland, P. (Peat, Marwick, Mitchell and Co., Anchorage, AK (USA)). Dec 1981. 145p. NTIS, PC A07/MF A01.

This report updates information on transportation systems contained in the environmental impact statement for the joint Federal-State Beaufort Sea lease sale in 1979. The updated information is intended to provide Bureau of Land Management Outer Continental Shelf staff with base data to which transportation demands for sale 71 can be added.

59177 **(PB—82-190174) Alaska OCS socioeconomic studies program. Technical report number 58. St. George basin petroleum development scenarios: transportation systems impact analysis. Final report.** Schmidt, R. (Peat, Marwick, Mitchell and Co., Anchorage, AK (USA)). Sep 1981. 395p. NTIS, PC A17/MF A01.

This report evaluates potential air and marine transportation systems impacts in Unalaska, Cold Bay, and St. Paul, Alaska following the proposed St. George Basin OCS lease sale 70, scheduled for February 1983. A detailed description of existing and anticipated transportation facilities and services is included for each of these communities. Forecasts of air and marine transportation demands without the economic influence of the lease sale area developed as a base case for comparative analysis. Petroleum development scenarios serve as forces of economic change following the lease sale.

0230 Properties

REFER ALSO TO CITATION(S) 59171, 59218, 59797

0250 Combustion

REFER ALSO TO CITATION(S) 59155, 59462, 59960

03 NATURAL GAS

0301 Reserves

REFER ALSO TO CITATION(S) 59157, 59158

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 59159, 59160, 59162

0303 Drilling, Production, And Processing

REFER ALSO TO CITATION(S) 59161, 59164

59178 **(PB—82-200643) Assessment of gas industry practices for odorization of natural gas. Final report Dec 80-Sep 81.** Larocque, G.R. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Dec 1981. 215p. NTIS, PC A10/MF A01.

A review of gas industry practices for odorization of natural gas was performed. The review included an examination of regulatory requirements and relevant case law to identify technical aspects of odorization which have been questioned during litigation. Usage patterns for natural gas odorants and odorant injection equipment were examined on the basis of industry interviews and results of a previous study. Prior research on odorant properties

was summarized. Odorizer designs were analyzed to determine the sensitivity of odorant injection rate to variations in gas flow rate, temperature, and pressure. Practices for monitoring of gas odorant levels were summarized and their statistical properties were examined. Several areas for potential improvement of odorization equipment and monitoring practices were suggested.

0305 Health And Safety

REFER ALSO TO CITATION(S) 59178

0308 Environmental Effects

59179 **(PB—82-198995) LNG plume interaction with surface obstacles. Final report Sep 80-Sep 81.** Kothari, K.M.; Meroney, R.N.; Neff, D.E. (Colorado State Univ., Fort Collins (USA). Dept. of Civil Engineering). Sep 1981. 154p. (CER—81-82KMK-RNM-DEN-22). NTIS, PC A08/MF A01.

A wind-tunnel test program was conducted on a 1:250 scale model to determine the effects of surface obstacles on the dispersion of LNG and neutral density plumes. The tests were conducted with continuous LNG boiloff rate of 30 m^3/min, 4 and 7 m/sec wind speeds and 21 different sets of surface obstacle configurations. Plots of ground-level concentration (mean and peak) contours were constructed. The highest concentrations were observed without any surface obstacles. In general, the lower speed resulted in higher ground-level concentration when the surface obstacle interacted with the plume. The mean concentration measured with neutral density plume was about three to five times smaller in magnitude than those observed with the LNG plume. The measured concentration for LNG plumes tended to have its maximum off the centerline. The addition of smaller buildings gave only slight reduction in the LFL distances. The simulated tree line resulted in approximately the same concentration parallel to the tree line.

59180 **(PB—82-199027) Behavior of LNG vapor clouds: wind-tunnel simulation of 40 m^3 LNG spill tests at China Lake Naval Weapons Center, California. Final report Jul 79-Jul 81.** Neff, D.E.; Meroney, R.N. (Colorado State Univ., Fort Collins (USA). Dept. of Civil Engineering). Jul 1981. 172p. (CER—81-82DEN-RNM-1). NTIS, PC A08/MF A01.

Wind-tunnel transient concentration data were obtained from modeling tests which reproduced gaseous dispersion from five different forty cubic meter or less liquefied natural gas (LNG) spills performed at China Lake Naval Weapons Center during the spring and summer of 1980. Comparisons in the transient concentration data between these modeled tests and the field tests indicated which parameters are dominant in the modeling process. Model tests which reproduced the wind shear and turbulence structure of the approach wind reproduced the concentration patterns measured at the field site. This result reinforced the predictive reliability of wind tunnel modeling of larger volume spills.

0309 Artificial Stimulation

59181 **(DOE/MC/11577—T2) Small-scale experiments with an analysis to evaluate the effect of tailored pulse loading on fracture and permeability. Quarterly report No. 1, June 11, 1979-December 11, 1979.** McHugh, S.L.; DeCarli, P.S.; Keough, D.D. (SRI International, Menlo Park, CA (USA)). Jan 1980. Contract AC21-79MC11577. 108p. NTIS, PC A06/MF A01. Order Number DE82021805.

Portions of document are illegible.

SRI International is taking part in a combined experimental and computational program with Science Applications, Inc., Sandia Laboratories, and the University of Maryland to examine methods for increasing the production of natural gas from marginal reserves by using well stimulation techniques. The method being examined is tailored pulse loading, i.e., shaping the borehole input pressure-time history to produce a specified fracture pattern. The program consists of three major tasks: (1) field experiments consisting of well bore shooting at less than full-scale using several different, available sources and with mineback to examine fracture patterns; minishots to derive in-situ fracture parameters for use in the calculations of fracture distributions, (2) laboratory experiments to determine material and fracture properties, (3) theoretical and computational work to improve the fracture modeling. Although it was originally proposed that the small-scale experiments be in Devonian shale, there were no sites readily available in the Devonian shale where it was possible to mineback around the explosive cavity to map the fracture produced in the experiments. Consequently METC decided to use Sandia Laboratory's facilities at the Nevada Test Site and perform the experiments in ashfall tuff. SRI International is performing laboratory and calculational efforts, Science Applications, Inc. (SAI) is performing fracture calculations, Sandia Laboratories is performing the small-scale field experiments, and the University of Maryland is performing additional laboratory experiments to provide information about explosive gas penetration into fractures. This report deals primarily with the status of the SRI program.

59182 **(UCRL—50482) Phenomenology and containment of underground nuclear explosions.** Germain, L.S.; Kahn, J.S. (Lawrence Livermore National Lab., CA (USA)). Nov 1968. 48p. (TID—4500; UC—2). NTIS.

This document dealing with some aspects of the phenomenology of underground nuclear explosions is divided into 4 general sections. First, the rather extensive history of routine underground explosions is examined, and it is noted that a nuclear explosion can be contained by putting it underground. Second, the calculations of early-time phenomenology are described, i.e., the interactions between the nuclear explosion and the media surrounding it during the first few tenths of a second after the explosion. An attempt is made to substantiate these calculations by showing how well they agree with actual measurements. Third, a parallel discussion is presented of the calculation of late-time phenomenology and the verification of these calculations by field observations. Fourth, the question is discussed of how containment is affected by geological features such as faults and joints. There have been many experiments in which phenomenological effects have been both predicted and measured. Typical examples in different rock materials are the Piledriver, Salmon, Gasbuggy, and Cabriolet Events. Cabriolet was a cratering experiment, and the other 3 were contained underground events.

0320 Transport, Pipelines, And Handling

59183 **(PB—82-195652) Evaluation of the critical nature of flaws in plastic pipeline gas distribution systems. Annual report Oct 80-Sep 81.** Popelar, C.H.; Richard, T.G. (Ohio State Univ. Research Foundation, Columbus (USA)). 30 Oct 1981. 89p. NTIS, PC A05/MF A01.

This grant is advancing the fracture mechanics methodology for describing crack growth. A model is used in which a small area around the crack tip is assumed to act as an ideally plastic solid and the rest of the material as a viscoelastic solid. Two analytical models have been developed and are being compared with experimental results. The strain rate dependency of basic mechanical properties of a polyethylene material typical of that used in gas distribution pipelines has been completed. Creep compliance has been defined using the time-temperature superposition principal. The rate of crack growth as a function of the intensity of the loading has been measured for a high-density, high-molecular-weight polyethylene. The mechanism of fracture in this material has been identified as successive rupturing of the lamellae in the highly deformed region ahead of the crack tip. With the fracture process zone attending the crack tip modeled as an ideally plastic solid and the bulk material modeled as a viscoelastic material, two analytical fracture models for slow stable crack growth in polymers have been developed.

0330 Properties

REFER ALSO TO CITATION(S) 59845

0340 Combustion

59184 (AD-A—112326/4) Laser Raman spectroscopy of flames; temperature and concentrations in CH_4/N_2O flames. Technical report. Vanderhoff, J.A.; Beyer, R.A.; Kotlar, A.J. (Army Armament Research and Development Command, Aberdeen Proving Ground, MD (USA). Ballistics Research Lab.). Jan 1982. 23p. (ARBRL-TR—02388). NTIS, PC A02/MF A01.

A laser Raman spectroscopy apparatus has been used to obtain temperature and major species (N_2, H_2, CO, CO_2, and H_2O) concentration measurements in the burnt gas region of CH_4/N_2O flames. Temperatures measured were in the range of 2100 to 2500 K with computed errors of less than 50 K. The concentration measurements are in good agreement with thermochemical equilibrium calculations.

59185 (NP—2906074) Natural gas reduction potential associated with selected residential energy efficiency measures. Macke, D.W. (Nebraska Legislative Research Office, Lincoln (USA)). 1 Sep 1980. 25p. NTIS, PC A02/MF A01. Order Number DE82906074.

The focus of this report is to explore, in a speculative way, the energy saving potential associated with certain gas-related productive conservation measures for Nebraska homes. Currently, market available energy efficient natural gas furnaces, water heaters, and major appliances offer cost effective and technically feasible energy and dollar saving solutions for consumers. Additionally, in some cases, the retrofit of electronic spark igniters and flue dampers are also technically and economically prudent for the consumer. One key solution for Nebraska to minimize dollar exports for natural gas imports is to reduce natural gas consumption through the more efficient use of it, thereby making existing supplies available for other consumers. The State of Nebraska in cooperation with the federal government and the Nebraska natural gas industry can accelerate the widespread adoption of these energy conservation devices through reasonable regulatory policies and financial incentives, coupled with reliable public information on these measures. Nebraska can by the year 2000 reduce from 10 to 20% of its current residential natural gas consumption through the widespread adoption of these devices.

04 OIL SHALES AND TAR SANDS

0401 Reserves And Exploration

REFER ALSO TO CITATION(S) 59187, 59188, 59189, 59190, 59199, 59221

59186 Hydrocarbon and uranium assessment of the Chattanooga (Devonian) shale in north Alabama, northwest Georgia and south Tennessee: a summary report. Rheams, K.F.; Rheams, L.J.; Copeland, C.W.; Neathery, T.L. (Univ. of Alabama, Huntsville). pp 161-166 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Devonian Chattanooga Shale occurs over almost all of north Alabama and south-central Tennessee. It ranges in thickness from 0 to 90 feet and is typically a dark gray to black shale with pyrite laminae and nodules. Very small lenses and interbeds of sandstone and siltstone, calcite streaks, phosphate nodules and cherty layers occur locally. The unit is correlative with the Gassaway Member as recognized in Tennessee. More than 120 outcrop sections have been measured and sampled within the study area. Approximately 500 shale samples have been collected from exposures and core holes and analyzed for oil content by Fischer Assay, and for uranium content. One hundred thirteen (113) samples from extreme north Alabama and south-central Tennessee have yielded greater than 7 g/t oil; the average value of these is 13 g/t, with a maximum of 23.9 g/t. Uranium values ranged from 0 to 88 ppM. Analyses of selected Chattanooga Shale cores indicate good correlation between outcrop and subsurface material. Shale samples of high oil content are typically very dark gray to black, slightly pyritic and some have a petroliferous odor. The shale ranges in thickness from 0 to 25 feet in the outcrop in the Highland Rim section in north Alabama and south-central Tennessee. Sandy and silty shale samples show a sharp decrease in oil yield values. Overburden in the Highland Rim section ranges from 0 to 140 feet. The Chattanooga Shale in this region appears to have accumulated in a shallow (less than 100 feet) marine reducing environment with a highly irregular shoreline and some scattered islands. If this depositional hypothesis is correct, it may account for the sporadic occurrence and variable thicknesses of the shale unit.

0402 Site Geology And Hydrology

59187 Overview of oil shale development in Ohio. Johnson, G.O. (Ohio Dept. of Energy, Columbus). pp 169-172 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The energy resource contained in the oil shale of Ohio represents a significant reserve for future development. These black shales were deposited during the Devonian and Mississippian Periods beneath a deep equatorial inland Kaskaskia sea that accumulated detrital organic sediments at the bottom. The oil rich shales of Ohio are the lower and upper Huron Members, the Cleveland Member of the Ohio Shale, and the Sunbury Shale. Thermal maturation of the vitrinite in the Ohio shale averages 0.54 Ro in Ohio. The present distribution of the oil shale in Ohio is in both glaciated and unglaciated areas in the north/south central and northeastern part of the state. The shale oil industry to develop these energy resources began with the pioneers and in 1866 with the St. Louis Shale Oil Company. Financial and technological interest continues today.

59188 Resource assessment of the New Albany Shale (Devonian and Mississippian) in southeastern Indiana - preliminary report. Hasenmueller, N.R. (Indiana Geological Survey, Bloomington). pp 173-180 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The New Albany Shale (Devonian and Mississippian), which consists essentially of brownish-black organic-rich shale and greenish-gray shale, is present throughout the Illinois Basin and is considered a potential source of hydrocarbons. In southeastern Indiana, where the shale crops out at the surface or underlies thin deposits of glacial drift, it is 100 to 130 feet thick. On the basis of lithology five members are recognized in the outcrop area; in ascending order these are the Blocher, Selmier, Morgan Trail, Camp Run, and Clegg Creek Members. An area including parts of Clark, Scott, and Jackson Counties has been identified as having the most potential for the initial development of the shale as a source of synthetic oil. This area was selected for study because (1) the percentage of organic carbon by weight in the shale is high; (2) the organic-rich shale facies is thick, (3) the shale is at or near the surface and could be removed by surface mining, and (4) the population is relatively sparse. In the study area the Blocher Member, the upper part of the Camp Run Member, and the Clegg Creek Member contain the highest percentage of organic carbon by weight. Because the Blocher is relatively thin, is underlain by carbonate rocks and is overlain by thicker shales with lower organic material, and contains an average of only 8.5% organic carbon, it is not considered a promising resource now. The combined thickness of the upper part of the Camp Run Member and the Clegg Creek Member ranges from 51 to 58 feet in the study area. This interval contains an average of more than 10% organic carbon by weight and has the greatest potential as a source of synthetic oil.

59189 **Geochemistry of the New Albany, Ohio and Sunbury shales in east central Kentucky.** Bland, A.E.; Robl, T.L.; Koppenaal, D.W. (Univ. of Kentucky, Lexington). pp 183-194 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Resource assessment work in Lewis and Fleming Counties, Kentucky, has indicated that Kentucky oil shales are potential synthetic fuel feedstocks. The Institute for Mining and Minerals Reserach (IMMR) of the University of Kentucky is continuing this work throughout the oil shale outcrop with support from the US Department of Energy and the Kentucky Department of Energy. This paper presents our evaluation to date of the oil shales in the east-central portion of the central Kentucky outcrop belt. It includes the analysis of shales from Rowan, Bath, Montgomery, Powell, and Estill Counties, Kentucky, and a comparison with data obtained earlier on the Lewis-Fleming County shales. Stratigraphic and geochemical data were obtained to provide: (1) basic information to assess the nature of the oil shale as a synthetic fuel feedstock; (2) preliminary information on the potential for by-product recovery; and (3) preliminary information on the reclamation and environmental characteristics of the resource.

59190 **Stratigraphy and resource assessment of the oil shales of east central Kentucky.** Pollock, D. (Univ. of Kentucky, Lexington); Barron, L.; Beard, J. pp 195-212 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Heightened interest in the organic rich shales of Mississippian and Devonian age as a source of oil has resulted in intensive leasing along the shale outcrop belt in Kentucky. Eleven cores of the black shales from the counties of Rowan, Bath, Montgomery, Powell, and Estill were examined and analyzed in an effort to relate details of stratigraphy to the oil rich horizons and to indicate areas of potential resources. This report does not treat Estill County regarding the resource assessment. Formations of interest are the Sunbury Shale (Early Mississippian Age) and the Ohio Shale (Late Devonian age). The name, Ohio Shale, is used throughout this report, but it was mapped as the New Albany Shale in the southern part of the study area by the USGS. The generalized stratigraphy is, in descending order: Borden Formation, Sunbury Shale, Bedford Shale, and Ohio Shale. Useful key markers in the sequence are the Three Lick Bed and Foerstia zone; which are both in the Ohio shale. The Three Lick Bed divides the Ohio Shale into the Cleveland Member, above, and the Huron Member, below. The Ohio Shale is underlain by the Middle Devonian Boyle Dolomite or the Silurian Bisher Dolomite, or the Crab Orchard Formation, also Silurian in age. The organic content is highest in the Sunbury Shale and in the Cleveland Member of the Ohio Shale. In the cores, the total thickness of the Sunbury Shale ranges from 17 to 4 feet (5.2 to 1.2 m). The thickness of the Bedford Shale, ranges from 18.0 to .2 feet (5.5 to .1 m). The Cleveland Member of the Ohio Shale ranges from 49.0 to 33.0 feet (14.9 to 10.1 m). Assuming a stripping ratio of 2.5:1, more than 4.5×10^6 acre-ft of shale having a carbon value of greater than 8% is minable by means of existing methods. A conservative estimate of the amount of the potential strippable shale-oil resources in the four county area is 3.88×10^9 bbls.

0403 Drilling, Fracturing, And Mining

REFER ALSO TO CITATION(S) 59199, 59226, 59227, 59228, 59229, 59231, 59232

59191 **Comparison of various aspects of mining oil shale in the western and eastern United States.** Lindquist, E.D.; Aho, G.D. (Cliffs Engineering, Inc., Rifle, CO). pp 39-41 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

An overview is given of the available open pit and underground mining techniques which may be applicable to mining oil shale. Specific mining methods are discussed for first generation western and eastern underground and eastern open pit oil shale mining. Estimated capital and operating costs are depicted for the three examples of shale mining that are discussed.

59192 **Evaluation of an oil shale mining and processing operation in Alabama.** Hilleke, A.F.; Hanna, H.S. (Univ. of Alabama, University). pp 43-54 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

An engineering plan and economic evaluation is presented for mining and processing 33,000 tons per day of oil shale at a specific site in Madison County, Alabama. The proposed plant is designed to produce about 10,000 barrels per day of oil from shale containing 10 to 15 gallons of recoverable oil as determined by the Modified Fischer Assay method. A mining study including plans for disposal of overburden and spent shale is presented. The location and operation of a plant to retort the shale using the Paraho process are described. Processing plant economics assuming 13 gallons of oil per ton of shale are presented. The economic analysis indicated that a 13% return on equity is possible at an oil selling price of $40.00 per barrel.

59193 **Comparison of coal and oil shale mining in Appalachia.** Bender, J. (Skelly and Loy Engineers-Consultants, Lexington, KY). pp 83-86 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The surface mining technique that is most applicable for extracting oil shale deposits is dictated by topography, geology, and extent of the reserves. A large percentage of the most promising oil shales lie under knobby terrain, isolated in ridgetops in deposits ranging in thickness from 15' to 50'. Since these topographical conditions are similar to those in the Appalachian coal field, several coal surface mining methodologies may be adaptable to efficiently extract oil shale. Mountaintop removal methods, particularly the cross-ridge mining technique, utilizing mobile equipment fleets will enable reclamation to be performed concurrently with mine advance. This paper analyzes the various operations that must be performed for an oil shale mine of this type and delineates key economic factors affecting mine planning. In addition, alternative stripping techniques that may prove successful are also presented.

59194 **Socio-economic impacts: validity of evidence from the coal mining industry in Kentucky.** Nesbitt, P.D.; Lovan, B.; Mays, J. (Nesbitt Engineering, Inc., Lexington, KY). pp 333-342 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

This study has analyzed a set of development factors and impacts on the oil shale and eastern coal producing regions of Kentucky. Both general and detailed analyses were performed. For purposes of comparison with existing coal county data, potential oil shale county development data were established by assuming a level of direct and indirect employment in each of the oil shale counties. Additionally, the oil shale region was divided into northeastern and central subgroups in order to investigate the existence of contrasts within the area. The analysis results indicate that definite contrasts exist between the oil shale and coal regions and within the oil shale region itself. Inter-region differences were evident in labor force, income, transportation and land use. Intra-region contrasts for oil shale were apparent for the factors of land use, income, principal industry ratio, and the two diversification indexes of location quotient and coefficient of specialization. In some respects, the northeastern oil shale counties resemble more closely the coal producing counties of eastern Kentucky from the other oil shale counties. These contrasting factors are related to many of the issues raised about the existing coal industry and the potential development of an oil shale industry. It is such differences that suggest any broad generalizations transferred from the coal region to

the oil shale region are inappropriate. The oil shale region should be analyzed on its own basis during future efforts to evaluate development impacts.

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 59187, 59192, 59217, 59218, 59219, 59220, 59221, 59223, 59224, 59227, 59228, 59229, 59230

59195 **(DOE/LC/10787—97) Investigation of the Geokinetics horizontal in-situ oil-shale-retorting process. Quarterly report, October, November, December 1981.** Bartlett, S.F. (Geokinetics, Inc., Salt Lake City, UT (USA)). Aug 1982. Contract FC20-78LC10787. 39p. NTIS, PC A03/MF A01. Order Number DE82020178.

Portions of document are illegible.

The ignition of Retort No. 25 took place on October 15, 1981. The operation was a success and the fire front remained uniform throughout the quarter. Production of crude shale oil from Retort No. 25 was 7153 barrels during the quarter. Stack gas analysis began on Retort No. 25 as part of normal air quality studies. The re-entry drilling program began on Retort No. 26 and all process wells were completed in December. Blasthole drilling began on the Retort No. 27 site in November. By the end of December, 16,416 feet had been drilled and an early February shot date is scheduled. Retort No. 27 will be twice the size of Retort No. 26. Lab personnel were involved in the testing of retort water for scrubbing purposes and the removal of H_2S gas. The new Kamp Kerogen water well was completed and put into service. Three mobile homes were relocated on the new mobile home park. Hookups were made and services provided.

59196 **(DOE/LC/10787—98) Investigation of the Geokinetics horizontal in-situ oil-shale-retorting process. Quarterly report, January, February, March 1982.** Bartlett, S.F. (Geokinetics, Inc., Salt Lake City, UT (USA)). Aug 1982. Contract FC20-78LC10787. 54p. NTIS, PC A04/MF A01. Order Number DE82020618.

Portions of document are illegible.

At the end of March 1982, Retort No. 25 was in its 167th day of burning with a total oil production of 16,599 barrels, an average of 99 barrels per day for this five month burn period. Total oil production for the first quarter was 9187 barrels, an average of 3062 barrels per month or 102 barrels per day. Various environmental studies were carried out on Retort No. 25 during this burn period, as defined in the Environment Research Plan. Stack gas analyses show that the retort operated within the PSD established emission levels. Lab and field experiments continued on a wet scrubber to remove H_2S and NH_3 from the process gas. Process and instrumentation wells were drilled on Retort No. 26. All process holes were completed in February and all instrumentation holes were finished in March. Installment of process manifolding, surface piping and thermocouples is continuing. The Retort No. 27 site was prepared for blasting during January and February with detonation of the retort accomplished on February 25. Retort No. 27, the first 2 acre retort, used 283,000 pounds of Ireco explosive loaded into 354 blast holes. Important data concerning the effect of retort size increase, early overburden motion and the effects of blast design modifications upon shale fracturing characteristics were obtained from this blast. Preliminary indications show that the blast was a success and post blast analysis is presently in progress to evaluate the characteristics of the blast. During the quarter, the second and third suite of samples for the Retort No. 25 fugitive emissions study were gathered. From this study, it was concluded that more sampling will be required before fugitive emission rates can be properly characterized.

59197 **(FE—1747-10) BX in-situ oil shale project. Quarterly technical progress report, September 1-November 30, 1979.** (Equity Oil Co., Salt Lake City, UT (USA)). 20 Dec 1979. Contract FC03-78ET13102. 113p. NTIS, PC A06/MF A01. Order Number DE82021816.

Portions of document are illegible.

The quarter September 1979-November 1979 was the first quarter of continuous operation of the BX In Situ Oil Shale Project. Steam injection began on September 18, 1979 and, with the exception of a hiatus in November during the acidizing of steam generating equipment, continued throughout the quarter. The steam injection rate averaged 1690 barrels per day at an average wellhead temperature of 497°F and an average pressure of 1199 PSIG. Except for 12 days of superheated steam injection, all steam injection took place at saturated conditions. Mechanical failures of steam generating equipment prevented superheated steam injection. No oil was produced from production wells during the quarter, however a very small amount was produced during the flowback of one of the injection wells, BX-30. Temperature increases of significant degree were noted in the temperature observation wells. During the quarter, all but one of the retorting runs planned in the laboratory program were completed. The results of these runs are encouraging for the field work because of the relatively high quality of the oil produced thus far in runs which are felt to most closely simulate in situ field conditions. Oil produced thus far has an average API Gravity of 28°, and a pour point of 27°F.

59198 **(LA—9463-MS) Cost analysis of the carbon monoxide steam process.** Parkinson, W.J.; Merson, T.J. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 15p. NTIS, PC A02/MF A01. Order Number DE82021834.

The Laramie Energy Technology Center has been investigating the use of a high-pressure carbon monoxide (CO) steam process to enhance the yield of oil from oil shale. Initially, the process showed much promise. One published laboratory run using this technique gave a product-recovery yield of 120% Fischer Assay. Unfortunately, the laboratory conditions for producing these high yields are quite different from those that would be required in a similar commercial process. Many assumptions had to be made to simulate the commercial process for cost analysis. Even though the process has an extremely high carbon recovery, it produces a relatively expensive product oil. The main reason for the high oil cost is the high-pressure retorting section, which uses high-pressure retorts and high-pressure feed and discharge systems. Another reason for the high cost is that not enough gas is produced in the retort to be reformed to produce make-up CO. The gas produced has a low heating value and must be upgraded significantly before it can be burned.

59199 **1981 eastern oil shale symposium proceedings.** Lexington, KY; Institute for Mining and Minerals Research (1982). 378p. (IMMR—82/066; CONF-811169—). IMMR, Publications Office, PO Box 13015, Lexington, KY 40512.

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

All papers plus three abstracts of papers presented at the 1981 Eastern Oil Shale Symposium are presented in this Proceedings. These papers covered the following: process technology; mining and reclamation technology; resource exploration and geochemistry; socio-economic and environmental studies; products, upgrading markets and economics. Forty papers have been abstracted and indexed. (ATT)

59200 **Analytical pyrolysis of eastern oil shales.** Reasoner, J.W. (Western Kentucky Univ., Bowling Green); Sturgeon, L.; Naples, K.; Margolis, M. pp 11-20 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The effects of ceiling temperature, heating rate (ramp) and pyrolysis interval on both the pyrolysis yield and relative product distribution for two eastern oil shales (Sunbury and Cleveland member of the Ohio Shale) were studied. The technique of analytical pyrolysis (pyrolysis - gas chromatography) was employed. Carefully controlled pyrolysis of the shale by this technique allows separation into high and low volatile components and measurement of the relative peak areas in the pyrogram gives the yield of the high volatile and low volatile components. Linear temperature ramps of 500°, 200° and 100°C per second were employed. Ceiling temperatures of 450° to 950°C and pyrolysis intervals of up to 20 seconds were investigated. Samples were also repeatedly pulsed to obtain intervals of up to 120 seconds. Carbon-hydrogen-nitrogen and thermal gravimetric analyses were also performed on the spent

shale. Our preliminary data suggest the following: (1) The total amount of pyrolysis product (organic liquids and gases) increases with increasing ceiling temperature. (2) The product molecular weight distribution decreases with increasing ceiling temperature and with increased rates of heating. (3) The effect of increased heat-up rates on yield enhancement seems to maximize in the 650° to 750°C region. (4) The lower ceiling temperatures require significantly longer pyrolysis intervals in order to obtain optimum yields.

59201 **Influence of retorting parameters on oil yield from Sunbury & Ohio shales from northeastern Kentucky.** Rubel, A.M.; Coburn, T.T. (Univ. of Kentucky, Lexington). pp 21-28 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

A comprehensive survey of retorting conditions and their effects on oil yield from master batches of two eastern oil shales (Sunbury Shale and the Cleveland Member of the Ohio Shale) has been undertaken. A small bench scale retort was used to study the following retorting parameters: upper temperatures from 500° to 1000°C; heating rates from 0.1 to 55°C/min; preheated inert (N_2) gas sweeps; and vacuum and steam retorting. Both Sunbury and Cleveland shales behave similarly when subjected to the variations in retorting parameters studied. Oil yields from both shales were not appreciably affected by changes in upper temperature limits between 500°C and 1000°C. Rapid removal of volatiles from the retort chamber during retorting with a preheated N_2 gas sweep, or by retorting under vacuum, enhances yield as does rapid heating. A heating rate of 55°C/min results in increased yields of 110 to 116% Fischer Assay. Retorting with steam also significantly increases oil yield. At a heating rate of 4°C/min with a 0.7 l/min steam flow, increases in oil yield were 125% Fischer Assay (Sunbury) and 123% Fischer Assay (Cleveland). Information gathered to date on Sunbury and Cleveland shales indicates that the optimum retorting technology will involve rapid heating coupled with rapid removal of volatiles from the retort chamber. For both shales the utilization of steam as a sweep gas should also be beneficial.

59202 **Oil shale hydrology - a transfer of knowledge from the coal regions.** Nesbitt, P.D.; Buschur, J.P. (Nesbitt Engineering, Inc., Lexington, KY). pp 31-37 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Many of the potential environmental problems faced by an emerging oil shale industry in eastern Kentucky are similar to those presently faced by the coal industry. One such problem is planning for water supplies for the associated mineral processing or preparation plants. Since shale oil retorts will require large volumes of water, the need for water supply evaluation is important when planning long term mining operations. In order to evaluate streamflow potentials, flow duration curves were analyzed for streams in the Licking, Red, and Kentucky River basins. Large rivers such as the Licking, Red, and the North Fork Kentucky have good low flow indeces which range from .038 cfs/mi^2 on the Red River at Clay City to .024 cfs/mi^2 on the Licking River at Farmers. Flow regulation on the Licking and Kentucky rivers have caused increases in the low flow indeces and have increased the amount of water available in the streams at all durations of time. Small tributaries and headwater streams have much lower low flow indeces. The lack of alluvium along these streams and their small drainage area reduces the amount of groundwater storage. The Licking River and Kentucky River have sufficient flow to supply shale retorting water needs. However, as mining progresses away from these rivers and towards upland areas, water distribution systems will have to be constructed.

59203 **Tosco technology applied to eastern US oil shales.** Pease, L.R. (Tosco Corp., Los Angeles, CA). pp 111-116 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The TOSCO II process was developed to process rich oil shales from the Western United States. Initial development started in 1955. During the period between 1964 to 1972 the process was demonstrated at the 1000 tons/day scale on such shales. This period included a run of 30 consecutive days, a period considered to prove sustained operability. The process will be used to process 66,000 tons/day of shale at the Colony Shale Oil Project in northwestern Colorado. The Colony project is a commercial venture of Exxon and Tosco Corporation which is scheduled to be on stream by late 1985. Eastern oil shales have several advantages over Western shales, including suitability for strip mining, private land ownership and local availability of refining capacity and infrastructure. To better utilize the Eastern shale and enjoy their advantages, Tosco has been developing spent shale combustion/gasification technology during the past several years. When integrated with the basic TOSCO II process, this technology is predicted to increase TOSCO II processing efficiency by 37% for Eastern shales.

59204 **Description of the T^3 process and its applicability to eastern oil shale.** Cha, C.Y. (Science Applications, Inc., Golden, CO). pp 117-125 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The Kingdom of Morocco has embarked on a development of their extensive oil shale resources to decrease future dependence on foreign petroleum imports and to support internal industrial growth. The Office National de Recherche of D'Exploitation des Petroleum has selected the T^3 semi-continuous surface retorting process, which has its roots in the extensive batch processing experience in the USA on the N-T-U process and the DOE 10-ton and 150-ton retorts. The T^3 process retains the salient features of the N-T-U batch retorting process while adding significant improvements based on recent technology development. The presentation will give the detailed description of the T^3 process, the comparison of the T^3 process with other oil shale processes, and the applicability of such a process to the Eastern oil shale. The presentation will also review the retorting characteristics of Eastern oil shale and compare them to the characteristics of Moroccan shale.

59205 **Paraho's retort technology for eastern oil shale.** Reeves, A.A.; Jones, J.B. Jr. (Paraho Development Corp., Grand Junction, CO). pp 127-135 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Following the presentation of the background of the Paraho process, this paper presents the following: Paraho oil shale retort-process description; Paraho oil shale process development; summary of Paraho oil shale operation; descriptions of Paraho indirect heated retort; Paraho combination heated retort, high carbon shale processing; commercial oil shale retort design; and Paraho-Ute commercial shale oil facility.

59206 **Superior's circular grate oil shale retorting process.** Knight, J.H.; Young, L.H. (Superior Oil Co., Englewood, CO). pp 137-145 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Superior's retorting process development effort focused on adaptation of the circular grate hardware for oil shale retorting. Both circular and straight grates have long been in commercial use for iron ore pellet sintering, cooling, and other kiln applications. This effort included construction and operation of an adiabatic fixed-bed retort designed to duplicate the conditions encountered by a section of solids as it travels through the separate processing zones in the circular grate. The adiabatic retort tests identified the significant process variables and their analyses established optimum ranges in which to design and operate the semi-works retort. The semi-works retort operations defined design and scale-up information for the oil removal system and control conditions. These operations also confirmed the mechanical reliability of solids flow on a variety of oil shales. The major results of this process development effort have been: (1) attainment of thermal efficiency for the cross-

flow circular grate which approaches that achieved in counter-current flow devices; (2) product oil yields of over 98% of Fischer Assay; (3) development and demonstration of a proven oil recovery system; and (4) optimized operation and process control conditions. Superior is currently completing the basic engineering design of a nominal 25,000 ton per day (15,000 barrel per day) demonstration plant. This program includes detailed engineering of a 60 meter diameter circular grate retort. Limited laboratory testing of Eastern United States oil shales by Superior has indicated that a high potential exists for these shales to be economically processed in a Superior circular grate retort. Methods based on Superior's circular grate process patents are presented and discussed in this paper.

59207 **Processing of eastern oil shale for liquid and gaseous fuels.** Ahmed, M.M.; Archer, D.H. (Westinghouse R & D Center, Pittsburgh, PA). pp 147-150 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Experiments have been carried out to investigate how Eastern Devonian oil shales might be processed most effectively to obtain liquid fuels. The key processing step, shale pyrolysis, has been studied using samples of Kentucky's Sunbury shale. The effects of shale heating rate, of vapor and solid residence times, and of gas composition on devolatilization products have been explored in laboratory scale fixed and fluidized bed reactors. Experiments have been conducted in nitrogen or hydrogen gas flows at atmospheric pressure and peak operating temperatures of 500 to 520°C. The products (liquid, gas and solid) collected have been analyzed and the information used to perform overall material and elemental balances. The experimental results have revealed that the primary process variables affecting liquid yield are peak temperature and vapor products residence time; and that only a certain fraction of Sunbury shale carbon can be recovered as liquid fuel independent of the heating rate and the reacting gas nature (N_2 or H_2). Comparison of the data obtained with those from IGT bench-scale and PDU tests using Sunbury shale reveals similar liquid yield and quality.

59208 **Fluidized bed oil shale retorting: a bench scale evaluation for eastern oil shale.** Margolis, M.J. (Univ. of Kentucky, Lexington). pp 151-155 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The effects of retorting eastern oil shale under extremely rapid heat-up rate conditions were investigated. Heat-up rates of ~ 33,000°C/min were investigated in both a simple quartz tube reactor and a fluidized bed system. The results from these studies indicate an improvement over the 30 to 35% carbon removal achieved under classical Fischer Assay conditions. Under rapid heat-up conditions 50 to 605 of the raw shale's carbon is easily removed. Evaluation of spent shale carbon analyses and product collection data suggest that 120 to 140% of Fischer Assay yield may be achieved. The data presented suggest thta a retort system incorporating the features of a fluidized bed reactor can provide the conditions necessary to effect this yield enhancement.

59209 **Eastern oil shale - past, present, and future.** Humphrey, J. (Highland Energy Corp., Olive Hill, KY); Addington, R. pp 215-220 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

From its founding the United States has played a dominant role in the development and production of the oil resources of the world. From 1776 on into the mid-eighteen hundreds the US was the leader in sperm and whale oil production - the leading oils for lighting and lubrication. Increased demand, declining supplies and price escalation resulted in the development of a coal and shale oil industry along the Ohio River Valley sometime around 1850. In 1859 petroleum was discovered at Titusville, Pennsylvania, and the modern oil industry was born. The price of natural petroleum rapidly fell from twenty dollars per barrel to ten cents. As a result the coal and shale oil industry could not compete. The end of each World War saw a renewed interest in oil shale, but commercial production was never realized. Today we are prepared to move forward in shale oil production from the same shales that produced oil in the eighteen hundreds.

59210 **Oil shale utilization at Morgantown.** Pitrolo, A.A.; Notestein, J.E.; Mei, J.S.; Shang, J.Y.; Zeng, L.W. (Dept. of Energy, Morgantown, WV). pp 221-233 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The Morgantown Energy Technology Center (METC), United States Department of Energy (US DOE), is the designated lead technology center for the areas of fluidized-bed combustion, coal gasification, gas cleanup, solids handling, and computer modeling. In pursuing the designated responsibility in fluidized-bed combustion, METC embarked on a comprehensive program of widening the fuel-supply base. Feasibility studies were conducted for various low-grade fuels and oil shales were among the fuels of interest to METC. Oil shale constitutes a major source of future fossil-energy supply in the form of direct combustion as well as retorting. Owing to the inherent high rates of heat and mass transfers inside the fluidized bed, the fluidized-bed combustor and retorting appear to be a desirable process technology for an effective and efficient means for oil-shale utilization. The fluidized-bed operation is a time-tested, process-proven, high-throughput, solid-processing operation which may contribute to the efficient utilization of oil-shale energy.

59211 **Dravo traveling grate process for oil shale retorting.** Forbes, F.; Kinsey, T.W. (Dravo Engineers and Constructors, Pittsburgh, PA.). pp 235-240 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Dravo began investigating the use of the traveling grate for retorting oil shale in late 1979. The program for the development of the Dravo traveling grate process from the laboratory through the pilot plant will be reviewed.

59212 **Eastern oil shale investigations at the University of Alabama.** Hanna, H.S.; Rampacek, C. (Univ. of Alabama, Huntsville). pp 241-251 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Laboratory and small continuous scale studies are being conducted to develop and evaluate innovative and advanced process technology for recovering oil from Eastern Devonian shale. Three major areas are under investigation: concentration of the fossil energy values into enriched products using standard beneficiation techniques accompanied by recovery of the oil from the upgraded products using conventional extraction techniques; development and evaluation of fluid-bed retorting of raw and beneficiated shale to recover liquid hydrocarbons followed by gasification of the char; and low to moderate temperature and pressure extraction of oil from raw and beneficiated shale. A novel feature of the program is the application of standard flotation techniques to recover concentrates containing about twice the Fischer Assay values found in the raw shale. The beneficiation step offers the potential benefits of reduced capital costs of plant equipment, lower processing costs, lower energy requirements and decreased environmental impact. Further, because of the finely-divided state of the beneficiated products, they should have superior heat transfer properties and greater chemical activity during retorting while permitting a broader choice of equipment with which to treat the shale. The second area of study, the fluidized-bed retorting of raw and beneficiated oil shale, has the objective of identifying various parameters favoring maximum oil and gas recovery from the finely-ground shale and determining the merits of fluid-bed processing as an alternative to conventional retorting. The third area of research involves low to moderate temperature and pressure extraction of liquid hydrocarbons from Eastern shale. Preliminary studies have indicated that,

under certain moderate conditions of temperature and pressure, a substantial portion of the kerogen-based oil can be extracted by the use of organic solvents.

59213 **Corrosion performance of engineering alloys in an atmospheric rotary kiln retort.** Spencer, D.; Saguees, A. (Univ. of Kentucky, Lexington). pp 253-264 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Corrosion test coupons of carbon steel, 410 stainless steel, and 304 stainless steel were exposed at two process points in an indirect heating, rotary auger retort which was processing eastern oil shale. The materials response was characterized by weight change determination, metallographic examination and elemental analysis of corrosion scales. Alloy performance improved with increasing alloy content. The highest corrosion rate observed was 84 mils per year for a carbon steel coupon exposed at a location with a temperature of 455°C. Examination of the corrosion scales revealed sulfidation and oxidation as the main deterioration mechanisms. The results are interpreted in terms of the environment surrounding the coupons and experiences in other retorting operations.

59214 **US Department of Energy's oil shale environmental mitigation program.** Hartstein, A.M.; Franklin, R.E. pp 267-271 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The largest untapped fossil fuel resource in the United States is the oil bearing shales in the western part of the country and the black shales in the east. The oil shale resource concentrated in three western states is estimated to be equivalent to more than two trillion barrels of crude oil and a comparable amount in the lean deposits of the Eastern US. The Department of Energy (DOE) has established a research and development (R & D) program for encouraging the development of the country's oil shale resource at a commercial scale to help in the mitigation of the present and future energy demands. The aim of the R & D Program is to stimulate the commercial production of oil shale by eliminating technical and environmental barriers. This paper provides an overview of the DOE R & D Program, addressing its essential environmental elements. Particular emphasis is given to the Department's internal planning process.

59215 **Mineral beneficiation of oil shale.** Ring, T.A. (Massachusetts Inst. of Tech., Cambridge). pp 305-309 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The potential mineral beneficiation routes for oil shale are compared using separation efficiency as a consistent measure of separation. Two general types of oil shale separations are compared. One type is based on a density difference between the kerogen and the minerals and the other type of separation is based on the wettability difference. Wettability separations are twice as efficient as the density separations, but even the wettability separations are a long way from being 100% efficient. All of these separations are performed in water and as a result require the concentrate to be dried before being retorted. For this reason, a dry separation method would be desirable. Such a method is electrostatic separation. Experiments are described which use this separation method. The results of these experiments show very low separation efficiencies for all size ranges investigated.

59216 **Processing routes for upgrading eastern shale oil to finished petroleum products.** Kerr, C.P. (Tennessee Technological Univ., Cookeville). pp 321-322 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The key to upgrading Eastern shale oil to finished petroleum products is primary and secondary hydrotreating. The primary hydrotreating of the crude shale oil would require new capital investment at an Eastern refinery. Existing refinery hydrotreating facilities would serve as secondary hydrotreating. Tennessee shale oil has a low pour-point and is transportable to refineries without upgrading facilities at the retort.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 59190, 59200, 59201, 59207, 59208, 59211, 59212, 59223, 59224

59217 **(UCID—19548) Fluidized-bed pyrolysis of oil shale: oil yield, composition, and kinetics.** Richardson, J.H.; Huss, E.B.; Ott, L.L.; Clarkson, J.E.; Bishop, M.O.; Taylor, J.R.; Gregory, L.J.; Morris, C.J. (Lawrence Livermore National Lab., CA (USA)). Sep 1982. Contract W-7405-ENG-48. 72p. NTIS, PC A04/MF A01. Order Number DE82021010.

Portions of document are illegible.

A quartz isothermal fluidized-bed reactor has been used to measure kinetics and oil properties relevant to surface processing of oil shale. The rate of oil formation has been described with two sequential first-order rate equations characterized by two rate constants, $k_1 = 2.18 \times 10^{10} \exp(-41.6 \text{ kcal/RT}) \text{ s}^{-1}$ and $k_2 = 4.4 \times 10^6 \exp(-29.7 \text{ kcal/RT}) \text{ s}^{-1}$. These rate constants together with an expression for the appropriate weighting coefficients describe approximately 97+ % of the total oil produced. A description is given of the results of different attempts to mathematically describe the data in a manner suitable for modeling applications. Preliminary results are also presented for species-selective kinetics of methane, ethene, ethane and hydrogen, where the latter is clearly distinguished as the product of a distinct intermediate. Oil yields from Western oil shale are approximately 100% Fischer assay. Oil composition is as expected based on previous work and the higher heating rates (temperatures) inherent in fluidized-bed pyrolysis. Neither the oil yield, composition nor the kinetics varied with particle size between 0.2 and 2.0 mm within experimental error. The qualitatively expected change in oil composition due to cracking was observed over the temperature range studied (460 to 540°C). Eastern shale exhibited significantly faster kinetics and higher oil yields than did Western shale.

59218 **Analysis of oils derived from Kentucky oil shales for potential refinery feedstocks.** Fabry, D.A.; Moore, H.F. (Ashland Petroleum Co., KY). pp 311-320 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Oil shales from the eastern United States are receiving increasing attention as potential sources of refinery feedstocks. In order to define potential refining factors for these materials, shale oils produced from Kentucky oil shale deposits have been evaluated. Results are presented for the whole crude oil and representative refining fractions derived therefrom. These properties are contrasted with similar data from western US shale oils, graphically demonstrating the differing character of these materials.

0407 Health And Safety

59219 **Eastern US (Devonian) oil shale industry health effects studies.** Enoch, H.G.; Lockard, J.; Sabharwal, P.S. (Univ. of Kentucky, Lexington). pp 383-388 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

We have undertaken a study of the health effects of eastern US (Devonian) oil shale. Much of the health effects research on oil shale elsewhere would be applicable to the industry in Kentucky. Since very few studies of oil shale effects are available, we have begun to examine some of the toxicological properties of raw shale oils. Using samples of eastern and western shale oils, we have measured acute toxicities in mice and genotoxocity in bacteria, mice, and

animal cells (mice and human) in culture. The genotoxicity assays included measures of mutagenesis, sister chromatid exchange, sperm abnormalities and erythrocyte micronuclei. The tests were also carried out on a coal-derived oil and a petroleum crude. In general, the results indicate that the toxic properties measured for shale oils closely resemble those of petroleum crude oil.

0408 Marketing And Economics

REFER ALSO TO CITATION(S) 59191, 59192, 59194, 59198, 59199

59220 **Potential economic impact of oil shale commercialization in Fleming County, Kentucky.** Miller, S.H. (Buffalo Trace Area Development District, Maysville, KY). pp 291-302 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The purpose of this paper is to research and evaluate the potential economic impact that may result from synthetic fuels development in Fleming County, Kentucky. The goal of this paper is to objectively present the anticipated economic benefits and costs that can result from the commercialization of extracting kerogen from oil shale in rural southeastern Fleming County, Kentucky.

59221 **Synthetic fuels from eastern oil shale.** Vyas, K.C. (Davy McKee Corp., Cleveland, OH); Aho, G.D.; Robl, T.L. pp 389-393 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The main objectives of this study were to make a resource assessment, a mining study, and a process evaluation of oil shale in Lewis and Fleming Counties, Kentucky. Two surface retorting processes, Paraho and HYTORT, were selected, and the process and economic analyses were made for a 30,000 tons/day oil shale retorting facility. The following conclusions can be drawn from this study: About 4.4 billion barrels of oil can be recovered from oil shale of Lewis and Fleming Counties, Kentucky. The shale reserves having an overall stripping ratio of less than 2.5:1, represent about 1.3 billion barrels of oil. A 30,000 tons per day retorting plant can produce about 10,000 bbl/day of shale oil. Total capital required for the grass roots Paraho plant facility, having a capacity to retort 30,000 tons per day of eastern oil shale, will be about $647 million and the HYTORT plant having the same capacity will require about $890 million. The initial plant investment costs for Paraho and HYTORT are $504 million and $695 million, respectively. For the same return on equity, the Paraho process is cheaper than the HYTORT process by about $20/bbl. For Paraho process, for a 75% debt @ 12% and 25% equity cash flow analysis, the return on equity at $40/bbl shale oil price is about 24%. Based on these results, it can be concluded that the production of shale oil from eastern oil shale is commercially feasibile.

0409 Waste Research And Management

REFER ALSO TO CITATION(S) 59214, 59226, 59228, 59229

59222 **(LBL—14666) Physicochemical treatment methods for oil shale wastewater: evaluation as aids to biooxidation.** Jones, B.M.; Sakaji, R.H.; Daughton, C.G. (Lawrence Berkeley Lab., CA (USA); California Univ., Richmond (USA). Sanitary Engineering and Environmental Health Research Lab.). Jul 1982. Contract AC03-76SF00098. 18p. (CONF-820441—5). NTIS, PC A02/MF A01. Order Number DE82020295.

From 15. oil shale symposium; Golden, CO, USA (27 Apr 1982).

Portions of document are illegible.

Biological treatment is usually effective for the mineralization of only one half of the organic carbon present in retort waters. Microbial growth is supported primarily by polar organic constituents, especially fatty acids. Explanations for the limitation to biooxidation are proposed, and several physicochemical treatment methods including sorption and chemical oxidation were evaluated for their abilities to complement or enhance biooxidation. The use of spent shale or powdered activated carbon (PAC) effected preferential sorption of the less polar, biorefractory organic compounds from retort water. The concurrent application of these sorbents with biooxidation, however, did not promote a synergistic removal. The construction and application of a pilot-scale adiabatic stainless steel and beaded-glass steam stripper for removal of ammonia, hydrogen sulfide, and carbon dioxide from oil shale process wastewaters is discussed; emphasis is placed on the benefits steam stripping would accord biooxidation. Ultraviolet radiation had no significant effect on the biorefractory organic solutes in retort water. Extensive ozonation structurally altered 14 percent of the recalcitrant dissolved organic carbon (DOC) and thereby promoted enhanced microbial mineralization. Ozonation mediated by ultraviolet radiation had a synergistic effect. More than 41 percent of the DOC, however, remained refractory to successive treatments by primary biooxidation, exhaustive chemical oxidation, and secondary biotreatment. Potent chemical oxidants apparently were incapable of effecting sufficient structural alteration of the biorefractory compounds to encourage renewed biooxidation. This implies that oxidative enzyme systems also may be incapable of promoting further alteration or mineralization of these recalcitrant solutes. Physicochemical methods that complement biotreatment may be required to upgrade oil shale wastewaters for reuse or codisposal.

59223 **Disposal concepts as related to retorted shale properties.** Gerhart, P.C.; Holtz, W.G. (Woodward-Clyde Consultants, Denver, CO). pp 87-97 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Economical development of shale oil depends in a significant way upon the successful stabilization of its solid waste product - retorted shale. The physical and chemical properties of retorted shale depend largely on the retorting process. Retorting temperature, residence time, initial crushing, mechanical reworking within the retort vessel, and post-retort cooling are believed to cause the most effect. Utilizing retorted shale physical characteristics wrought by these processes, stable, environmentally acceptable embankments can be constructed.

59224 **Engineering properties of Kentucky oil shales.** Drnevich, V.P.; Hopkins, T.C.; Allen, D.L.; Hale, S.S. (Univ. of Kentucky, Lexington). pp 99-107 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Excavation, handling, and the environmentally safe disposal of spent oil shale and overburden materials require a knowledge of their geotechnical engineering properties. To determine these properties, a laboratory investigation of the physical and geotechnical engineering properties was made. The physical tests consisted of mechanical analyses, Atterberg Limits, and specific gravity determinations. Geotechnical properties were determined by moisture-density analyses, triaxial compression, permeability tests, slake-durability, one-dimensional compression tests, and Los Angeles abrasion. A one-dimensional compression test was devised to address the problem of placement, loading, and saturation of the spent shales and overburden materials. The compacted, unprocessed oil shales were more susceptible to inundation and compression than compacted specimens of retorted shales and chars. Comparisons of the geotechnical properties of the unprocessed oil shales and processed shales are made.

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 59195, 59196, 59199, 59231

59225 **(CONF-820739—1) Eastern oil shales: critical environmental issues.** Oakes, K.M. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE82018158.

From International symposium on modelling, policy, and economics of energy; and power systems and alternative energy sources and technology; Cambridge, MA, USA (7 Jul 1982).

Eastern oil shales, located in Kentucky, Indiana, Ohio, and Tennessee, may contain over 67 billion m^3 (423 billion barrels) of oil. Extraction of oil from eastern shales probably will be by surface or underground mining of the shale followed by surface retorting. Major environmental concerns will be associated with disposal of the great volumes of spent shale. The effects of shale disposal will depend upon the speed and success of revegetation of the spent shales, and potential transport of toxic constituents in the shale leachate to surface waters. Preliminary characterizations of raw and spent eastern shales indicate that most leachates will be acidic and may contain several trace metals. Revegetation potential of the spent eastern shales is unknown. Other environmental issues include the effects of mining of the shales, atmospheric emissions from shale retorting, and treatment and disposal of process wastewaters, the constituents of which are poorly known. Research needs are highlighted.

59226 **Preliminary research on potential reclamation of oil shale mined lands in Kentucky.** Hamon, W.R.; Kruspe, R.R. (Univ. of Kentucky, Lexington). pp 55-81 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The objective of this study was to conduct a preliminary investigation of the potential reclamation of oil shale mined land in Kentucky. Tests were made to assess the potential for establishing an adequate vegetative medium by use of the available soil and overburden materials, the potential for use of processed oil shales to improve the physical properties of high clay materials, and the potential treatments and vegetative species that would provide for the establishment of an adequate vegetative cover. These tests included the determination of physical and chemical properties of the field sampled and processed materials, including information on macronutrients, micronutrients, other pertinent elements and soluble salts, and growth chamber tests. Materials for the tests were obtained from five widely separated sites in the Knobs region and from one site in the Cumberland Saddle area. Admixtures containing equal parts of soil or overburden materials and raw or processed oil shales, along with soil and overburden materials, were used to grow ryegrass in a growth chamber to test the assumption that a more desirable physical plant growth medium would result while retaining nutrient, pH, soluble salts, and other factors at desirable or tolerable levels. Yields from the admixtures were about 68% of the highest yielding soil material.

59227 **Environmental research for eastern oil shale.** Bates, E.R.; Herrmann, J.G.; Martin, J.F.; Thurnau, R.C. (Industrial Environmental Research Lab., Cincinnati, OH). pp 343-347 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The US Environmental Protection Agency's Industrial Environmental Research Laboratory in Cincinnati, Ohio (IERL-Ci) has performed research related to oil shale processing and disposal since 1973. More recently, the Laboratory has become involved in research related to oil shale mining. The major thrust of this research work has been directed toward the large oil shale deposits located in Colorado and Utah where much of the pilot scale development of the oil shale industry has been concentrated. Increased emphasis in developing Eastern oil shales has heightened interest in defining and resolving environmental concerns related to these extensive resources. IERL-Ci is interested in defining environmental problems related to Eastern oil shale development, evaluating the transferability of environmental control technology from related areas, such as Western oil shale development and Eastern coal mining, to Eastern oil shale development, and in developing new control technology as necessary. Initially, samples of Eastern retorted oil shale, such as HYTORT, are being evaluated to assist in the development of technology applicable to spent shale disposal in the East. Research sponsored by IERL-Ci is being closely coordinated with other federal and state agencies.

59228 **Preliminary assessment of environmental impacts of obtaining oil from Chattanooga shale.** Tolbert, V.R.; Eddlemon, G.K.; Ketelle, R.H.; McBrayer, J.F.; McKeown, R.R.; Waits, E.D.; Webb, J.W. (Oak Ridge National Lab., TN). pp 349-356 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The environmental impacts of producing 8000 m^3/d of oil from the Chattanooga Formation by means of underground mining and surface retorting have been assessed. The major impacts were determined to be those associated with surface disposal of spent shale. Disposal of spent shale can have a significant impact on surface and groundwater quality as the result of trace elements and toxic substances leached from the shale. Changes in water quality from these releases and those associated with land disturbance can have significant long-term effects on aquatic biota. Significant changes in land use and effects on terrestrial ecosystems can occur if large areas are covered with spent shale and cannot be revegetated. From this assessment, it was determined that additional information must be obtained about the resource and extraction processes before impacts associated with development of the Chattanooga Formation can be more precisely quantified.

59229 **Potential impact of oil shale development on water resources in Kentucky.** Mitsch, W.J.; Lind, C.G. (Univ. of Louisville, KY). pp 357-368 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Major water resource issues that may emerge in Kentucky should oil shale development occur are discussed. Water quality and streamflow from three major watersheds that contain oil shale reserves as described. Potential water quality problems from shale mining, shale processing and spent shale disposal are presented.

59230 **Leaching studies on Kentucky oil shale products.** Koppenaal, D.W.; Cisler, K.; Thomas, G. (Univ. of Kentucky, Lexington). pp 369-382 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Laboratory leaching studies on a suite of Kentucky oil shales and their associated retorted and combusted products are described. Standardized batch extraction procedures were performed and evaluated on the basis of their leaching media composition, particle morphology, solid : liquid ratio, and contact time characteristics. Leachate composition was monitored via pH, conductivity, total organic carbon, anion (SO_4^{2-}, Cl^-, NO_3^-), cation (Na^+, K^+, Ca^{2+}, Mg^{2+}), and trace element (Ag, As, Ba, Cd, Cr, Pb, Se, Hg, and others) determinations. Illustrative results from the studies are presented and discussed in relation to their environmental impact, regulatory compliance, and applicability to field disposal conditions.

0420 Regulations

REFER ALSO TO CITATION(S) 59656

59231 **Industry and environmental comments on Kentucky's proposed oil shale regulatory program.** Shogren, R. (Dept. for Natural Resources and Environmental Protection, Frankfort, KY). pp 273-281 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

Due to an increased interest in mining Kentucky's oil shale resources, the 1980 Session of the General Assembly passed legislation (KRS 350.600) mandating the Department for Natural Resources and Environmental Protection (DNREP) to develop regulations for oil shale operations to minimize and prevent their adverse effects on the citizens and the environment of the Commonwealth. The Department designed the proposed regulations with an emphasis similar to existing coal mining regulations. The Department filed the proposeed oil shale regulations with the Regulations Compiler on June 30, 1981, as mandated by the legislation. Public comment on the proposed regulations has been extensive. Industry representatives have criticized the regulations as placing severe constraints on the development of a major new industry and recommended withdrawal of the proposed regulations until technical studies are completed which better define environmental impacts. Environmental representatives fear that the oil shale industry will create severe environmental impacts and support stringent regulations. The Kentucky DNREP will submit a formal response to the comments in December, 1981, with recommended changes in the proposed regulations.

59232 **Comparison of proposed oil shale regulations with coal mining regulations.** Zaluski, J.J.; Kinkel, S.G. (Zaluski, Seay & Kirkland, Frankfort, KY). pp 283-289 of 1981 eastern oil shale symposium proceedings. Lexington, KY; Institute for Mining and Minerals Research (1982).

From Eastern oil shale symposium; Lexington, KY, USA (15 Nov 1981).

The Kentucky General Assembly through the adoption of KRS 350.600 mandated the Kentucky Department for Natural Resources and Environmental Protection to promulgate reasonable regulations for the mining of oil shale in the Commonwealth. Although the statute itself consists of some six short paragraphs, the Department for Natural Resources and Environmental Protection has proposed some 137 pages of regulations. An attempt is made in this paper to comment on several portions of the proposed regulations and to compare those to the proposed coal mining regulations of the Commonwealth. The paper discusses the following four areas: permitting regulations; performance bond regulations; performance standard regulations; and enforcement procedure regulations.

05 NUCLEAR FUELS

0501 Reserves

59233 (INIS-SU—86, pp 224) **Modern radiochemical methods in study of natural nuclear reactors.** Kruglov, A.K.; Pchelkin, V.A.; Sviderskij, M.F.; Moshchanskaya, N.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59234 **(USGS-OFR—81-83) Analytical data on uranium-ore-bearing samples collected in the southern part of the Powder River Basin, Wyoming, 1972 to 1979.** Santos, E.S. (Geological Survey, Washington, DC (USA)). 1981. 75p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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Analytical data are compiled for uranium-ore-bearing samples collected by the author and members of the US Geological Survey. All samples were analyzed in the Denver laboratories of the US Geological Survey. The procedures followed were standard procedures in use at the time the samples were submitted and include fluorescence spectroscopy, delayed neutron analysis, radiometric analysis, x-ray fluorescence analysis and semiquantitative spectrographic analyses. Each sample and sample suite is described in terms of sample locality, physical properties, and chemical composition. Wherever a sample suite has some continuity and seems to show some significant relationship between element distribution and geologic features, it has been illustrated and described as a suite. The distribution of selected elements in the suite is shown by means of a graph. Isolated samples are described separately as miscellaneous samples. In addition to being identified by their field number, each sample is also identified by a serial number assigned by the analytical laboratories.

0502 Exploration

REFER ALSO TO CITATION(S) 59186

59235 **(GJBX—195-82-Vol.2B-Solitario) Airborne gamma-ray spectrometer and magnetometer survey: Solitario, Texas Detail Area. Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). [nd]. Contract AC13-76GJ01664;AC13-79GJ01692. 170p. NTIS, PC A08/MF A01. Order Number DE82021622.

Volume IIB contains appendices for the following: flight line maps; geology maps; explanation of geologic legend; flight line/geology maps; radiometric contour maps; magnetic contour maps; multi-variant analysis maps; and geochemical factor analysis maps. (ATT)

59236 **(GJBX—195-82-Vol.2B-Christmas) Airborne gamma-ray spectrometer and magnetometer survey: Christmas Mountains, Texas Detail Area. Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). [nd]. Contract AC13-76GJ01664;AC13-79GJ01692. 192p. NTIS, PC A09/MF A01. Order Number DE82021621.

Volume IIB contains appendices for the following: flight line maps; geology maps; explanation of geologic legend; flight line/geology maps; radiometric contour maps; magnetic contour maps; multi-variant analysis maps; geochemical factor analysis maps.

59237 **(GJBX—195-82-Vol.2B-GreenValley) Airborne gamma-ray spectrometer and magnetometer survey: Green Valley/0-2 Ranch, Texas Detail Area. Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). [nd]. Contract AC13-76GJ01664;AC13-79GJ01692. 309p. NTIS, PC A14/MF A01. Order Number DE82021623.

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Volume IIB contains appendices for the following: flight line maps; geology maps; explanation of geologic legend; flight line/geology maps; radiometric contour maps; magnetic contour maps; multi-variant analysis maps; geochemical factor analysis maps. (ATT)

59238 **(GJBX—40-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Glasgow NTMS quadrangle, Montana.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Jun 1982. Contract AC13-76GJ01664;W-7405-ENG-36. 153p. NTIS (US Sales Only). Order Number DE82020450.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Glasgow NTMS quadrangle, Montana. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through C describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, stream-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing

results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

59239 **(GJBX—66-82) Hydrogeochemical and Stream-Sediment Reconnaissance basic data for Beaumont, Lake Charles, and Baton Rouge quadrangles, Texas; Louisiana. Uranium Resource Evaluation Project.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). 7 Jun 1982. Contracts AC13-76GJ01664;W-7405-ENG-26. 21p. (K/UR—421). NTIS (US Sales Only). Order Number DE82020438.

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Hydrogeochemical data are compiled for Stream-Sediment Reconnaissance of Beaumont, Lake Charles, and Baton Rouge quadrangles in Texas and Louisiana.

59240 **(GJBX—69-82) Hydrogeochemical and Stream-Sediment Reconnaissance basic data for Sherman, Texarkana, El Dorado, and Greenwood quadrangles, Oklahoma; Texas; Arkansas; Mississippi. Uranium Resource Evaluation Project.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). 9 Jun 1982. Contracts AC13-76GJ01664;W-7405-ENG-26. 95p. (K/UR—424). NTIS (US Sales Only). Order Number DE82020436.

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Data are compiled for the Hydrogeochemical and Stream-Sediment Reconnaissance of Sherman, Texarkana, El Dorado, and Greenwood quadrangles in Oklahoma, Texas, Arkansas, and Mississippi.

59241 **(GJBX—78-82) Hydrogeochemical and stream-sediment reconnaissance basic data for Jenkins Quadrangle, Kentucky; Virginia; West Virginia. Uranium Resource Evaluation Project.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.). 3 Jun 1982. Contract AC13-76GJ01664;W-7405-ENG-26. 96p. (K/UR—433). NTIS (US Sales Only). Order Number DE82020431.

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Hydrogeochemical data are compiled for the stream-sediment reconnaisance of Virginia, West Virginia, and Jenkins Quadrangle in Kentucky. (ATT)

59242 **(GJBX—80-82) Hydrogeochemical and Stream-Sediment Reconnaissance basic data for Marion, Canton, Pittsburgh, and Cleveland quadrangles, Ohio; West Virginia; Pennsylvania. Uranium Resource Evaluation Project.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). 7 Jun 1982. Contracts AC13-76GJ01664;W-7405-ENG-26. 61p. (K/UR—435). NTIS (US Sales Only). Order Number DE82020430.

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Data are compiled for the Hydrogeochemical and Stream-Sediment Reconnaissance of Marion, Canton, Pittsburgh, and Cleveland quadrangles of Ohio, West Virginia, and Pennsylvania.

59243 **(GJBX—85-82) Hydrogeochemical and Stream-Sediment Reconnaissance basic data for Utica quadrangle, New York. Uranium Resource Evaluation Project.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). 7 Jun 1982. Contracts AC13-76GJ01664;W-7405-ENG-26. 95p. (K/UR—440). NTIS (US Sales Only). Order Number DE82020429.

Hydrogeochemical data are compiled for Stream-Sediment Reconnaissance of Utica quadrangle in New York.

59244 **(GJBX—87-82) Hydrogeochemical and Stream-Sediment Reconnaissance basic data for Ogdensburg and Lake Champlain quadrangles, New York; Vermont. Uranium Resource Evaluation Project.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). 9 Jun 1982. Contracts AC13-76GJ01664;W-7405-ENG-26. 75p. (K/UR—442). D. Order Number DE82020417.

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Hydrogeochemical data are compiled for Steam-Sediment Reconnaissance of Ogdensburg and Lake Champlain quadrangles in New York and Vermont.

59245 **(GJBX—88-82) Hydrogeochemical and Stream-Sediment Reconnaissance basic data for Bangor quadrangle, Maine. Uranium Resource Evaluation Project.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Oak Ridge Gaseous Diffusion Plant, TN (USA)). 9 Jun 1982. Contracts AC13-76GJ01664;W-7405-ENG-26. 116p. (K/UR—443). NTIS (US Sales Only). Order Number DE82020453.

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Hydrogeochemical data are compiled for Stream-Sediment Reconnaissance of Bangor quadrangle in Maine.

59246 **(GJBX—114-82) Effect of the physical properties of the overburden on helium emanometry. National Uranium Resource Evaluation.** Pogorski, L.A.; Pogorski, S.R. (Bendix Field Engineering Corp., Grand Junction, CO (USA); Helium Surveys, Inc., Grand Island, NY (USA)). Sep 1981. Contract AC13-76GJ01664. 210p. NTIS, PC A10/MF A01. Order Number DE82020500.

During the period of 1977 to 1978, a detailed soil helium study (40 samples per square kilometer) was carried out over three known mineralized areas, each being approximately 2.5 square kilometers in extent. These areas were: the Red Desert and Copper Mountain research sites in Wyoming, and the Spokane Mountain research site in Washington State. The result of the detailed study indicated that there was an association between the soil helium anomalies and the known uranium orebodies. This study was carried out in order to determine whether the technique could be used on a semi-reconnaissance basis (10 samples per square kilometer) and to determine if the helium anomalies truly indicate the presence of uranium deposits or reflect the variations in the physical properties of the overburden. The physical properties studied were the porosity and permeability of the rocks. This study was carried out at the Red Desert research site and at the Copper Mountain research site.

59247 **(GJBX—138-82) Three applications of Hydrogeochemical and Stream-Sediment Reconnaissance data interpretation for a selected region in south-central Alaska. National Uranium Resource Evaluation.** Beyth, M.; McInteer, C.; Averett, W.R.; Stablein, N.K. (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Feb 1982. Contracts AC13-76GJ01664;W-7405-ENG-36. 108p. (LA—8465-MS). NTIS, PC A06/MF A01. Order Number DE82020327.

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Data analysis to evaluate uranium and other strategically important mineral resources was carried out on Hydrogeochemical and Stream-Sediment Reconnaissance data from a selected region in south-central Alaska. Parts of the Alaska Range have areas that appear to be favorable for the occurrence of uranium; the main source rocks were probably Tertiary granitic plutons. This study suggests a probable association of uranium with copper, nickel, and base metals. Sediments with significantly high gold, tin, antimony, tungsten, and cadmium are associated with main mineralized areas.

59248 **(GJBX—139-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Selawik NTMS quadrangle, Alaska.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Jul 1982. Contract AC13-76GJ01664;W-7405-ENG-36. 103p. NTIS (US Sales Only). Order Number DE82020448.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Selawik NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through D describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, and lake-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

59249 **(GJBX—140-82) Uranium Hydrogeochemical and Stream-Sediment Reconnaissance of the Seward NTMS quadrangle, Alaska. National Uranium Resource Evaluation.** D'Andrea, R.F. Jr.; Zinkl, R.J.; Shettel, D.L. Jr.; Langfeldt, D.L.; Hardy, L.D. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Jul 1982. Contracts AC13-76GJ01664;W-7405-ENG-36. 131p. D. Order Number DE82020447.

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This report presents results of a Hydrogeochemical and Stream-Sediment Reconnaissance (HSSR) of the Seward NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through D describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, and lake-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

59250 **(GJBX—143-82) Uranium Hydrogeochemical and Stream-Sediment Reconnaissance of the Bendeleben NTMS quadrangle, Alaska. National Uranium Resource Evaluation.** Langfeldt, S.L.; Hardy, L.C.; D'Andrea, R.F. Jr.; Zinkl, R.J.; Shettel, D.L. Jr. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Jul 1982. Contracts AC13-76GJ01664;W-7405-ENG-36. 113p. NTIS (US Sales Only). Order Number DE82020446.

Portions of document are illegible.

This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Bendeleben NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through D describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting program of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, and lake-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

59251 **(GJBX—156-82) Statistical techniques applied to aerial radiometric surveys (STARRS): discriminant-analysis methods applied to aerial radiometric data and their application to uranium favorability in South Texas. National Uranium Resource Evaluation.** Pirkle, F.L.; Stablein, N.K.; Koch, C.D.; Johnson, M.E.; Newman, C.K.; Bement, T.R.; Patterson, D.A. (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Jul 1982. Contract AC13-76GJ01664;W-7405-ENG-36. 114p. NTIS, PC A06/MF A01. Order Number DE82020961.

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In an effort to establish radiometric signatures of geologic units, ten discriminant analysis techniques were applied to aerial radiometric data collected along the Texas Gulf Coast for the US Department of Energy's National Uranium Resource Evaluation (NURE) Program. Results of this study show that partial discriminant analysis with the linear discriminant function (LDF) applied to the raw data is useful for establishing radiometric signatures and for classifying new observations. Signatures for favorable and unfavorable units along the Texas Gulf Coast were established and new observations were then classified as being from units favorable or unfavorable for hosting uranium deposits based on the established training sets.

59252 **(GJBX—195-82-Vol.1) Airborne gamma-ray spectrometer and magnetometer survey. Volume I. Detail areas. Final report, Christmas Mountains, Solitario, Green Valley/O-2 Ranch, Texas.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1982. Contract AC13-76GJ01664. 98p. NTIS PCE07/MF $9.98. Order Number DE82021614.

Includes 34 sheets of 48x reduction microfiche.

Data were collected by a helicopter equipped with a gamma-ray spectrometer with a large crystal volume, and with a high sensitivity proton precession magnetometer. The radiometric system was calibrated at the Walker Field Calibration pads and the Lake Mead Dynamic Test Range. Data quality was ensured during the survey by daily test flights and equipment checks. Radiometric data were corrected for live time, aircraft and equipment background, cosmic background, atmospheric radon, Compton scatter, and altitude dependence. The corrected data were statistically evaluated, gridded, and contoured to produce maps of the radiometric variables, uranium, potassium, and thorium; their ratios; and the residual magnetic field. These maps have been analyzed in order to produce a multi-variant analysis contour map based on the radiometric response of the individual geological units. A geochemical analysis has been performed; using the radiometric and magnetic contour maps, the multi-variant analysis map, and factor analysis techniques; to produce a geochemical analysis map for the area. Volume I contains a description of the systems used in the survey, a discussion of the calibration of the systems, the data collection procedures, the data processing procedures, the data presentation,

the interpretation rationale, and the interpretation methodology. Separate Volumes II-A and II-B for each detail area contain the data displays and the interpretation results.

59253 **(PGJ/F—099-82) National Uranium Resource Evaluation: Pratt Quadrangle, Kansas.** Fair, C.L.; Smit, D.E. (Bendix Field Engineering Corp., Grand Junction, CO (USA); Wichita State Univ., KS (USA)). Aug 1982. Contract AC13-76GJ01664. 126p. NTIS PCE05/MF A01. Order Number DE82020602.

Includes 1 sheet of 24x reduction microfiche.

Surface reconnaissance and detailed subsurface studies were done within the Pratt Quadrangle, Kansas, to evaluate uranium favorability using National Uranium Resource Evaluation criteria. These studies were designed in part to follow up previous airborne radiometric, hydrogeochemical, and stream-sediment surveys. More than 8100 well records were examined in the subsurface phase of this study. Results of these investigations indicate no environments favorable for uranium deposits within the Pratt Quadrangle. Environments considered unfavorable for uranium deposits are limestone and dolomite environments, marine black shale environments, evaporative precipitate environments, and fluvial sandstone environments. Environments considered unevaluated because of insufficient data (although some thin sections were available for study) include Precambrian plutonic, metamorphic, and sedimentary rocks.

59254 **(USGS-OFR—81-565) Helium soil-gas survey of a portion of the McDermitt Caldera complex, Malheur County, Oregon.** Reimer, G.M. (Geological Survey, Washington, DC (USA)). 1981. 10p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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A helium soil-gas survey was performed in the vicinity of the Bretz mine within a portion of the McDermitt Caldera complex, Malheur County, Oregon. The area surveyed included the Aurora uranium minerlized area. The overall helium concentrations were high, averaging 52 ppB above ambient air. The highest helium values were found in two areas inside the caldera. Those areas were located immediately to the west and to the southeast of the known uranium mineralization. The ground-water environment, which can control the location of the helium anomaly from uranium deposits, has not been resolved. If these helium anomalies are directly related to the uranium, though somewhat displaced form the source deposits, then helium may have unique potential for locating other, similar uranium deposits within the Caldera complex.

59255 **(GJBX—195-82-Vol.2A-GreenValley) Airborne gamma-ray spectrometer and magnetometer survey: Green Valley/0-2 Ranch, Texas Detail Area. Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1980. Contract AC13-76GJ01664;AC13-79GJ01692. 934p. NTIS, PC A99/MF A01. Order Number DE82021624.

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Volume IIA contains the following: geology of 0-2 Ranch, Green Valley; radioactive mineral occurrences in Texas; geophysical data interpretation; references; and appendices for stacked profiles, geologic histograms, geochemical histograms, speed and altitude histograms, geological statistical tables, geochemical statistical tables, magnetic and ancillary profiles and test line data. (ATT)

59256 **(GJBX—195-82-Vol.2A-Solitario) Airborne gamma-ray spectrometer and magnetometer survey: Solitario, Texas Detail Area. Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1980. Contract AC13-76GJ01664;AC13-79GJ01692. 397p. NTIS, PC A17/MF A01. Order Number DE82021619.

Portions of document are illegible.

Volume IIA contains the following: geology of Solitario; radioactive mineral occurrences in Texas; geophysical data interpretation; references; and appendices for stacked profiles, geologic histograms, geochemical histograms, speed and altitude histograms; geologic statistical tables, geochemical statistical tables, magnetic and ancillary profiles, and test line data. (ATT)

59257 **(GJBX—195-82-Vol.2A-Christmas) Airborne gamma-ray spectrometer and magnetometer survey: Christmas Mountains, Texas Detail Area. Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1980. Contract AC13-76GJ01664;AC13-79GJ01692. 272p. NTIS, PC A12/MF A01. Order Number DE82021620.

Portions of document are illegible.

Volume IIA contains the following: geology of Christmas Mountain; radioactive mineral occurrences in Texas; geophysical data interpretation; references; and appendices for stacked profiles, geologic histograms; geochemical histograms; speed and altitude histograms; geologic statistical tables; geochemical statistical tables; magnetic and ancillary profiles, and test line data. (ATT)

0503 Mining

REFER ALSO TO CITATION(S) 59259

0504 Feed Processing

REFER ALSO TO CITATION(S) 59804, 59805

59258 **(NUREG—0859) Compliance determination procedures for environmental radiation protection standards for uranium recovery facilities 40 CFR part 190.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Material Safety and Safeguards). Mar 1982. 35p. NTIS, PC A03/MF A01.

Uranium Milling operations are licensed by the Nuclear Regulatory Commission and by some States in agreement with the Commission. The radiation dose to any individual from the operation of facilities within the uranium fuel cycle is limited to levels set by the Environmental Protection Agency. These levels are contained in the EPA Environmental Radiation Protection Standards for Nuclear Power Operations, in Part 190 of Title 40 of the Code of Federal Regulations (40 CFR Part 190). This report describes the procedures used within NRC's Uranium Recovery Licensing Branch for evaluating compliance with these regulations for uranium milling operations. The report contains descriptions of these procedures, dose factors for evaluating environmental measurement data, and guidance to the NRC staff reviewer.

59259 **(NUREG/CR—2869) Directory and profile of licensed uranium-recovery facilities.** Warkentien, J.S.; Busch, L.S.; DePue, J.; Sundell, R.; Gordon, C.Z. (Argonne National Lab., IL (USA)). Jul 1982. Contract W-31-109-ENG-38. 110p. (ANL/ES—128). NTIS, PC A06/MF A01 - GPO $5.50.

Information on licensed uranium production facilities as of December 1981 has been compiled. Conventional mills, in-situ projects, heap leach operations, and other types of uranium recovery systems are described in essay and tabular form. The data base includes all licensed facilities in the Agreement and Non-Agreement States. This report also contains a description of the system used for storage and retrieval of all information presented.

59260 **Method for oxygen reduction in a uranium-recovery process.** Hurst, F.J.; Brown, G.M.; Posey, F.A. (to Dept. of Energy). US Patent Application 318,081. 4 Nov 1981. 16p. Contract W-7405-ENG-26.

An improvement in effecting uranium recovery from phosphoric acid solutions is provided by sparging dissolved oxygen contained in solutions and solvents used in a reductive stripping stage with an effective volume of a nonoxidizing gas before the introduction of the solutions and solvents into the stage. Effective volumes of nonoxidizing gases, selected from the group consisting of argon, carbon dioxide, carbon monoxide, helium, hydrogen, nitrogen, sulfur dioxide, and mixtures thereof, displace oxygen from the solutions and solvents thereby reduce deleterious effects of oxygen such as excessive consumption of elemental or ferrous iron and accumulation of complex iron phosphates or cruds.

0505 Enrichment

REFER ALSO TO CITATION(S) 59473

59261 **(GAT—996) Nitrogen-system safety study: Portsmouth Gaseous Diffusion Plant.** (Goodyear Atomic Corp., Piketon, OH (USA)). Jul 1982. Contract AC05-76OR00001. 55p. NTIS, PC A04/MF A01. Order Number DE82020571.

The Department of Energy has primary responsibility for the safety of operations at DOE-owned nuclear facilities. The guidelines for the analysis of credible accidents are outlined in DOE Order 5481.1. DOE has requested that existing plant facilities and operations be reviewed for potential safety problems not covered by standard industrial safety procedures. This review is being conducted by investigating individual facilities and documenting the results in Safety Study Reports which will be compiled to form the Existing Plant Final Safety Analysis Report which is scheduled for completion in September, 1984. This Safety Study documents the review of the Plant Nitrogen System facilities and operations and consists of Section 4.0, Facility and Process Description, and Section 5.0, Accident Analysis, of the Final Safety Analysis Report format. The existing nitrogen system consists of a Superior Air Products Company Type D Nitrogen Plant, nitrogen storage facilities, vaporization facilities and a distribution system. The system is designed to generate and distribute nitrogen gas used in the cascade for seal feed, buffer systems, and for servicing equipment when exceptionally low dew points are required. Gaseous nitrogen is also distributed to various process auxiliary buildings. The average usage is approximately 130,000 standard cubic feet per day.

59262 **(K/OA—4912) Analysis of gas flow in a centrifuge.** Berger, M.H. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Aug 1982. Contract W-7405-ENG-26. 176p. NTIS, PC A09/MF A01. Order Number DE82020607.

Thesis. Submitted to Univ. of Tennessee, Knoxville. Portions of document are illegible.

Onsager's sixth order, elliptic, partial differential equation with Ekman boundary layer suction describing linearized flow in a gas centrifuge has been rederived from the linearized compressible Navier-Stokes equations by asymptotic methods. A Galerkin weak formulation is detailed for two-dimensional flow with internal heat and momentum sources and sinks. An exact solution of Onsager's Pancake equation, with a point source or sink of axial momentum, in the long bowl limit has been developed. A high order, smooth, tensor product finite element that has nearest neighbor support is proposed to make practical computations for some symmetric and antisymmetric flow problems. A qualitative description of the singularities due to two-dimensional point sources or sinks is given along with approximations of the resultant flow fields. Effects of Ekman pumping and pure two-dimensional flow are illustrated. Finally, asymptotic solutions are given for the so-called auxiliary equation.

0507 Fuels Production And Properties

59263 (INIS-SU—86, pp 186) **Behaviour of volatile radioactive impurities during fluorination of uranium-bearing materials.** Galkin, N.P.; Khomyakov, V.I.; Kharin, V.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59264 (INIS-SU—86, pp 223-224) **Transformations of uranium oxides in liquid nitrogen tetroxide.** Kobets, L.V.; Klavsut, G.N.; Dolgov, V.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59265 (INIS-SU—99, pp 111-112) **Thermodynamic calculations of phase equilibria during phase diagrams plotting of U-Pu-C system in 1200-2500 deg C interval.** Udovskij, A.L.; Alekseeva, Z.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59266 **(WAPD-TM—1476) Fabrication of thin-wall annular pellets (AWBA development program).** Burke, T.J. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). May 1982. Contract AC11-76PN00014. 68p. NTIS, PC A04/MF A01. Order Number DE82022072.

A compaction technique for the preparation of as-sintered high density thin-wall (0.050 in.) annular fuel pellets having inside walls straight and parallel to the pellet axis has been developed. This development was undertaken to produce straight walled fuel annuli for a two-region pellet containing a high density solid thoria central pellet. UO_2 and UO_2-ThO_2 annular pellets were pressed with length to diameter ratios of 1.0 to 2.0 to establish the optimum conditions for dimensional control. Optimum wall straightness was obtained by control of the axial density gradient in the as-pressed compact. A tapered core rod was used to obtain parallelism between the inside wall and the pellet axis.

59267 **(WAPD-TM—1515) Chemical milling of Zircaloy tubing to produce integral OD spiral finned tubes (AWBA development program).** Horwood, W.A. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Feb 1982. Contract AC11-76PN00014. 41p. NTIS, PC A03/MF A01. Order Number DE82022078.

A detailed process description is provided for producing integral spiral fins on the outside surface of Zircaloy nuclear fuel cladding tubes by masking with pressure sensitive tape strips and then chemical milling (pickling) the tube wall between the tape strips to leave the fins in relief. Fins up to 0.020 inch high by 0.05 to 0.12 inch wide were consistently produced on tubes having wall thickness of 0.008 inch or greater after fin pickling. Wall thickness uniformity was excellent. Information is provided on tube surface preparation to maximize tape mask adhesion time during pickling, acid chemistry control to prevent local tube wall thinning near the fin, and pickling techniques to promote uniform material removal. Simple fixture designs are described for quickly and conveniently applying the tape strips to the tube wall in an accurate spiral. 13 figures, 4 tables.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 59278, 59285, 59288, 59792

59268 (INIS-SU—86, pp 182) **Physicochemical fundamentals of choice of organic solvent for extraction processes of regeneration of nuclear power station spent fuel.** Nikiforov, A.S.; Shmidt, V.S.; Rozen, A.M.; Egorov, G.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59269 **Considerations for handling failed fuel at the Barnwell Nuclear fuel plant.** Anderson, R.T.; Cholister, R.J. (Allied-General Nuclear Services, P.O. Box 847, Barnwell, SC 29812). *Transactions of the American Nuclear Society;* **41**: 114(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59270 **(RFP-Trans—321) Gas-chromatographic determination of trace amounts of DBP and MBP in the TBP-kerosene system.** Geng, Y.; Yin, S. Translated from *Heh Hua Hsueh Yu Fang She Hua Hsueh ;* **1**: No. 1, 68-79(1979). Contract AC04-76DP03533. 18p. NTIS, PC A02/MF A01. Order Number DE82020134.

Portions of document are illegible.

Using a new type of alkali flame ionization detector (AFID) for the determination of trace amounts of DBP and MBP in the system of 30%-kerosene, two procedures are given. (1) Direct determination of DBP and MBP in the range of 1×10^{-5} to 5×10^{-4} M. The effect of interfering materials has been investigated. A quantitative method of three sample injections is proposed to elimi-

nate the interference of unknown peak. (2) The separate determination of trace amounts of DBP and MBP can be measured in the range 2 x 10^{-7} to 1 x 10^{-5} M. The separation conditions and results are given. The operation of AFID is described, and a simplified methylating procedure is presented.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 59314, 59315, 59916

59271 **(OENORM-S—2600) Radioactive waste. Guidelines for the collection.** (Oesterreichisches Normungsinstitut (ON), Vienna. Fachnormungsausschuss 088 Strahlenschutz). 1 Aug 1981. 8p. (In German). Oesterreichisches Normungsinstitut A-1020 Vienna, Leopologasse 4, Austria.

The guidelines entitled "Oenorm S 2600" contain recommendations for the collection of radioactive wastes excluding those arising from nuclear fuel reprocessing plants. Different categories of waste are defined, containers are specified and transport regulations are referred to. (G.G.).

59272 **(PNL—3721) Defense waste transportation: cost and logistics studies.** Andrews, W.B.; Cole, B.M.; Engel, R.L.; Oylear, J.M. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 106p. (TTC—0191). NTIS, PC A06/MF A01. Order Number DE82021966.

Transportation of nuclear wastes from defense programs is expected to significantly increase in the 1980s and 1990s as permanent waste disposal facilities come into operation. This report uses models of the defense waste transportation system to quantify potential transportation requirements for treated and untreated contact-handled transuranic (CH-TRU) wastes and high-level defense wastes (HLDW). Alternative waste management strategies in repository siting, waste retrieval and treatment, treatment facility siting, waste packaging and transportation system configurations were examined to determine their effect on transportation cost and hardware requirements. All cost estimates used 1980 costs. No adjustments were made for future changes in these costs relative to inflation. All costs are reported in 1980 dollars. If a single repository is used for defense wastes, transportation costs for CH-TRU waste currently in surface storage and similar wastes expected to be generated by the year 2000 were estimated to be 109 million dollars. Recovery and transport of the larger buried volumes of CH-TRU waste will increase CH-TRU waste transportation costs by a factor of 70. Emphasis of truck transportation and siting of multiple repositories would reduce CH-TRU transportation costs. Transportation of HLDW to repositories for 25 years beginning in 1997 is estimated to cost $229 M in 1980 costs and dollars. HLDW transportation costs could either increase or decrease with the selection of a final canister configuration. HLDW transportation costs are reduced when multiple repositories exist and emphasis is placed on truck transport.

59273 **(SAND—82-1710C) Assessment of the effect of TRU waste definition on the cost of transporting contact-handled transuranic Defense wastes to a repository.** Pope, R.B.; Reese, R.T.; Romesberg, L.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-820845—1). NTIS, PC A02/MF A01. Order Number DE82019431.

From Alpha-contaminated waste management meeting; Gaithersburg, MD, USA (10 Aug 1982).

Transuranic (TRU) defense wastes are being, and will continue to be, moved between a number of locations in the United States. The DOE is sponsoring the development of safe, efficient, licensable, and cost-effective transportation systems to handle these wastes. One system being developed for transporting contact-handled TRU wastes has been named TRUPACT which stands for TRansUranic PACkage Transporter. The first packaging design in the TRUPACT family will be identified as TRUPACT-I, and will be bi-modal, capable of truck or rail carriage. TRUPACT-I will be compatible with Type A packagings used by waste generators, interim storage facilities, and repositories. The TRUPACT packagings are required to be Type B packagings since larger than Type A quantities of some radionuclides (particularly plutonium) are often contained in the Type A packagings in which the wastes are placed for storage and disposal. TRUPACT must provide structural and thermal protection to the waste when exposed to normal transport and hypothetical accident environments specified in Federal regulations. The TRUPACT-I is described in this paper. The costs associated with transporting contact-handled TRU wastes produced as part of the defense program from waste sources to a terminal waste respository for the first 20 years of repository operation are defined. The effects on the costs of changing the definition of transuranic wastes from greater than 10 to greater than 100 nanocuries per gram are also presented.

59274 **(SAND—82-1894C) Spent-fuel transportation experience and issues: transshipments and storage casks.** Allen, G.C.; Cashwell, J.W.; Madsen, M.M.; Shirley, C.G. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 9p. (TTC—0350; CONF-820943—1). NTIS, PC A02/MF A01. Order Number DE82020625.

From ANS topical meeting - spent fuel storage; Savannah, GA, USA (26 Sep 1982).

Significant numbers (>5100) of spent fuel assemblies from commercial light water reactors have been transported in the US over the last twenty years with an excellent safety record. This paper presents information on experience in the United States involving the transportation of commercial light water reactor (LWR) spent fuel. In addition, accident and incident data relative to spent fuel cask shipping activities are reviewed. Current transportation-related issues involving spent fuel storage are discussed.

59275 **Updated analysis of the radiological risk of transport of radioactive material in the United States.** Taylor, J.M.; Madsen, M.M.; Wilmot, E. (Sandia National Laboratories, Albuquerque, NM 87185). *Transactions of the American Nuclear Society;* **41**: 90(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59276 **Risk of transporting spent nuclear fuel by train.** Elder, H.K. (Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352). *Transactions of the American Nuclear Society;* **41**: 91(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59277 **Experimental program for assessing the thermal response of a spent fuel transport cask.** Vigil, M.G.; Trujillo, A.A.; Yoshimura, H.R. (Sandia National Laboratories, Albuquerque, NM 87185). *Transactions of the American Nuclear Society;* **41**: 92(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

0520 Waste Management

REFER ALSO TO CITATION(S) 59325, 59326, 59532, 59562, 59821, 59835, 59852, 59899

59278 **(CONF-820833—12) Organic iodine removal from simulated dissolver off-gas streams using partially exchanged silver mordenite.** Jubin, R.T. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE82020837.

From 17. DOE nuclear air cleaning conference; Denver, CO, USA (1 Aug 1982).

The removal of methyl iodide by adsorption onto silver mordenite was studied using a simulated off-gas from the fuel dissolution step of a nuclear fuel reprocessing plant. The methyl iodide adsorption of partially exchanged silver mordenite was examined for the effects of NO/sub x/, humidity, filter temperature, and degree of silver exchange. Partially exchanged silver mordenite, in general, achieved significantly higher silver utilizations than the fully exchanged material. Silver utilizations of > 95% were achieved, assuming the formation of AgI. The experimental results indicate that CH_3I loadings increase proportionally with silver loading up to 5 wt % silver and then appear to level off. Tests conducted to deter-

mine the effect of temperature on the loading showed higher loadings at 200°C than at either 150 or 250°C. The presence of NO, NO_2, and H_3O vapor showed negligible effects on the loading of CH_3I. In contrast to iodine loaded onto fully exchanged silver mordenite, the iodine loaded onto the partially exchanged silver mordenite could not be stripped by either 4.5% hydrogen or 100% hydrogen at temperatures up to 500°C. A study of the regeneration characteristics of fully exchanged silver mordenite indicates a decreased adsorbent capacity after complete removal of the iodine with 4.5% hydrogen in the regeneration gas stream at 500°C. The loss of adsorbent capacity was much higher for silver mordenite regenerated in a stainless steel filter housing than in a glass filter housing. A cost evaluation for the use of the partially exchanged silver mordenite shows that the cost of the silver mordenite on a once-through basis is < $10/h of operation for a 0.5-t/d reprocessing plant.

59279 **(CONF-820854—2) Overview of DOE LLWMP waste treatment, packaging, and handling activities.** Pechin, W.H. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020819.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

The program objective is to develop the best available technology for waste treatment, packaging, and handling to meet the needs of shallow land burial disposal and for greater confinement than shallow land burial. The program has reviewed many of the hardware options for appropriate usage with low-level waste, but promising options remain to be evaluated. The testing of treatment technologies with actual radioactive process wastes has been initiated. The analysis of the interaction of treatment, solidification and disposal needs to be completed.

59280 **(DOE/EIS—0084) Incineration facility for radioactively contaminated polychlorinated biphenyls and other wastes.** (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Jun 1982. Contract W-7405-ENG-26. 429p. NTIS, PC A19/MF A01. Order Number DE82021911.

The statement assesses the environmental impacts associated with the construction of an incineration facility and related support facilities for the disposal of hazardous organic waste materials (including PCBs) which are contaminated with trace quantities of low-assay enriched uranium. The proposed action includes the incineration facility at Oak Ridge, Tennessee and storage, packaging, and shipping facilities at the Gaseous Diffusion Plants in Paducah, KY, and Portsmouth, OH; hazardous organic wastes from these plants and from the Y-12 Plant and Oak Ridge National Laboratories would be shipped to the proposed incineration facility. Impacts assessed include the effects of the project on air and water quality, on socioeconomic conditions, on public and occupational health and safety, and on ecology. Additionally, the statement presents an assessment of the potential impacts from accidents at the incineration facility or during transportation of the waste materials to the facility. The major impact identified was the potential for short-term occupational exposure to high concentrations of PCBs in smoke during the worst credible accident; mitigation of this impact will be addressed during the final design of the proposed facility. Alternatives which were assessed include no action, chemical destruction processes, and alternative transportation routes; all would have greater adverse impact or would increase the risk of an accident with the potential for adverse impact. The alternatives of commercial disposal, alternative sites, multiple incinerators, and alternative modes were eliminated from detailed analysis either because they are not feasible or because preliminary analysis showed that they would have clearly more adverse impact upon the environment than the proposed action.

59281 **(DOE/NBM—2020371) Connecticut State Briefing Book for low-level radioactive-waste management.** (EG and G Idaho, Inc., Idaho Falls (USA); Centaur Associates, Inc., Washington, DC (USA)). Jun 1981. Contract AC07-76ID01570. 186p. NTIS, PC A09/MF A01. Order Number DE82020371.

Portions of document are illegible.

The Connecticut State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Connecticut. The profile is the result of a survey of Nuclear Regulatory Commission licensees in Connecticut. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may affect waste management practices in Connecticut.

59282 **(DOE/NBM—2020708) Florida State Briefing Book for low-level radioactive waste management.** (EG and G Idaho, Inc., Idaho Falls (USA); Envirosphere Co., New York (USA); Kane, Parsons and Associates, Inc., New York (USA)). Jun 1981. Contract AC07-76ID01570. 245p. NTIS (US Sales Only). Order Number DE82020708.

Portions of document are illegible.

The Florida State Briefing Book is one of a series of State briefing books on low-level radioactive waste management practices. It has been prepared to assist State and Federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Florida. The profile is the result of a survey of NRC licensees in Florida. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Florida.

59283 **(DOE/NBM—2020716) Indiana State Briefing Book for low-level radioactive-waste management.** Mitter, E.L.; Hume, R.D.; Briggs, H.R.; Feigenbaum, E.D. (EG and G Idaho, Inc., Idaho Falls (USA); Indiana Univ., Bloomington (USA). School of Public and Environmental Affairs). 24 Dec 1981. Contract AC07-76ID01570. 207p. NTIS, PC A10/MF A01. Order Number DE82020716.

Portions of document are illegible.

The Indiana State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Indiana. The profile is the result of a survey of NRC licensees in Indiana. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Indiana.

59284 **(DOE/NBM—2020718) Delaware State Briefing Book on low-level radioactive-waste management.** (EG and G Idaho, Inc., Idaho Falls (USA); Centaur Associates, Inc., Washington, DC (USA)). Jul 1981. Contract AC07-76ID01570. 191p. NTIS, PC A09/MF A01. Order Number DE82020718.

Portions of document are illegible.

The Delaware State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators

in Delaware. The profile is the result of a survey of NRC licensees in Delaware. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Delaware.

59285 **(DOE/NE—0039) Program summary. Nuclear waste management and fuel cycle programs.** (USDOE Assistant Secretary for Nuclear Energy, Washington, DC). Jul 1982. 79p. NTIS, PC A05/MF A01. Order Number DE82021692.

This Program Summary Document describes the US Department of Energy (DOE) Nuclear Waste Management and Fuel Cycle Programs. Particular emphasis is given to near-term, specifically Fiscal Year (FY) 1982, activities. The overall objective of these programs will be achieved by the demonstration of: (1) safe radioactive waste management practices for storage and disposal of high-level waste and (2) advanced technologies necessary to close the nuclear fuel cycle on a schedule which would assure a healthy future for the development of nuclear power in this country.

59286 **(EGG—2192) Use plan for demonstration radioactive-waste incinerator.** Cooley, L.R.; McCampbell, M.R.; Thompson, J.D. (Maryland Univ., Baltimore (USA)). Apr 1982. Contract AC07-76ID01570. 93p. NTIS, PC A05/MF A01. Order Number DE82019407.

Portions of document are illegible.

The University of Maryland at Baltimore was awarded a grant from the Department of Energy to test a specially modified incinerator to burn biomedical radioactive waste. In preparation for the incinerator, the Radiation Safety Office devised a comprehensive plan for its safe and effective use. The incinerator plan includes a discussion of regulations regarding on-site incineration of radioactive waste, plans for optimum use in burning four principal waste forms, controlled air incineration technology, and standard health physics safety practices; a use plan, including waste categorization and segregation, processing, and ash disposition; safety procedures, including personnel and area monitoring; and methods to evaluate the incinerator's effectiveness by estimating its volume reduction factors, mass and activity balances, and by determining the cost effectiveness of incineration versus commercial shallow land burial.

59287 **(ESG-DOE—13385) RMDF leach-field decontamination. Final report.** Carroll, J.W.; Marzec, J.M.; Stelle, A.M. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 15 Sep 1982. Contract AM03-76SF00701. 61p. NTIS, PC A04/MF A01. Order Number DE82021125.

Portions of document are illegible.

The objective of the decontamination effort was to place the Radioactive Materials Disposal Facility (RMDF) leach field in a condition suitable for release for unrestricted use. Radioactively contaminated soil was excavated from the leach field to produce a condition of contamination as low as reasonably achievable (ALARA). The contaminated soil was boxed and shipped to an NRC-licensed burial site at Beatty, Nevada, and to the DOE burial site at Hanford, Washington. The soil excavation project successfully reduced the contamination level in the leach field to background levels, except for less than 0.6 mCi of Sr-90 and trace amounts of Cs-137 that are isolated in cracks in the bedrock. The cracks are greater than 10 ft below the surface and have been sealed with a bituminous asphalt mastic. A pathways analysis for radiation exposure to humans from the remaining radionuclides was performed, assuming intensive home gardening, and the results show that the total first year whole body dose equivalent would be about 0.1 mrem/year. This dose equivalent is a projection for the hypothetical ingestion of vegetables grown on the site. Assuming that an average adult consumes 64 kg of green leafy vegetables per year and that the entire yearly supply could be grown on the site, the amount of ingested Sr-90 and Cs-137 is calculated to be 1100 pCi/year and 200 pCi/year. This ingested quantity would produce a total first year whole body dose equivalent of 0.10 mrem, using the accepted soil-to-plant transfer factors of 0.0172 and 0.010 for Sr-90 and Cs-137, respectively. The whole body dose equivalent exposure value of 0.1 mrem/year is far below the tentative limit established by NRC of 5 mrem/year for areas released for unrestricted use.

59288 **(ETR—312) Application of the EUROWATT process to waste organic solvents in a pilot plant.** Humblet, L.; van Geel, J. (European Company for the Chemical Processing of Irradiated Fuels, Mol (Belgium)). Nov 1981. 33p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702642.

A pilot unit for the treatment of spent solvent was built and operated to demonstrate the feasibility of the EUROWATT process and to treat all the spent organic solvents in storage on the Eurochemic site. A battery of mixer-settlers adapted to the process was tested. A prototype pyrolyser was developed and worked perfectly during the whole operating time of the unit. The present report describes the different parts of the apparatus, the controls and safety devices. The radioactive spent solvents have been treated in eight campaigns lasting one week each. Comments are given on the results obtained during operation. Finally, some improvements to the facility are suggested.

59289 **(HEDL-TC—362) Application of acid digestion to reprocessing wastes and chemicals.** Lerch, R.E. (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1975. Contract AC06-76FF02170. 21p. NTIS, PC A02/MF A01. Order Number DE82022042.

A wide variety of waste materials or chemicals potentially associated with fuel reprocessing operations were treated using acid digestion. The materials were divided into three categories: organic solvents, cleaning solutions and decontamination reagents, and miscellaneous process chemicals. In addition, separate studies were performed to determine the behavior of iodine, ruthenium, and soluble neutron poisons in the acid digester. Studies were also performed to determine the fate of plutonium, americium, and uranium in the acid digestion system. All chemicals examined were decomposed, with the exception of carbon tetrachloride (CCl_4) and normal paraffin hydrocarbon (NPH) which distilled from the digester. As expected, ruthenium and iodine volatilized during acid digestion. Dry, solid potassium permanganate reacted very violently in the acid digester, probably due to formation of manganese heptoxide which is explosive at high temperatures. Potassium permanganate should not be added to the digester in large quantities in dry solid state. Plutonium and americium form semi-soluble sulfates during acid digestion and will remain with the process residue. Both are readily leachable in dilute nitric acid. Solubilities of plutonium and americium were estimated to be 0.1 g/l and 0.0015 g/l, respectively. Uranium, on the other hand, is soluble in acid digestion solutions to greater than 100 g/l. Limited laboratory data indicate the acid digestion process is capable of processing combustible solid wastes from reprocessing plants. However, limitations could be imposed by the volatilization of iodine and ruthenium from the digester. Accordingly, the level of radioactivity in effluents will require further evaluation.

59290 **(INER—0377) Studies of sea dumping of radioactive waste: sorption by pelagic sediments.** Hong, L.H. (Institute of Nuclear Energy Research, Lung-Tan (Taiwan)). May 1982. 37p. (In Chinese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82905295.

To understand the situation of contamination after the radiowastes have been disposed in the seabed, the effect of adsorption of the fission products and corrosive radioactive products of the solidified wastes on pelagic sediments has been studied. The adsorption of the non-radioactive cations such as Cs^+, Sr^{++}, Co^{++}, etc. on the sediments, at different depth of the seabed, is investigated. The adsorption capacity of Cs^+, Sr^{++} and Co^{++} on the pelagic sediments is 11.6 meq/100 g, 14.4 meq/100 g and 16.7 meq/100 g, respectively. Seawater composition, temperature and pH value at a depth of 5000 meters have been considered.

59291 **(INIS-mf—7049) Stripa project, quarterly report October through December 1981.** (Swedish Nuclear Fuel Supply Co., Stockholm). Jan 1982. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780688.

The methodology development for hydrogeological investigations in boreholes is continuing in combination with hydraulic, chemical and isotopic characterization of granites and groundwaters. The migration investigation is continued by drilling sampling holes and designing the equipment. The first buffer mass tests have covered the measurement of temperature, swelling pressures and water migration in two deposition holes. The preparation of the bentonite/sand backfill has started.

59292 (INIS-SU—86, pp 219-220) **Safe fixation of radioactive wastes in glasses and glassceramics for environment protection.** Minaev, A.A.; Prokhorova, N.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59293 (INIS-SU—86, pp 219) **Rock salt as a medium for radioactive waste disposal.** Krivokhatskij, A.S.; Sinitsyna, G.S.; Bryzgalova, R.V.; Rogozin, Yu.M.; Savonenkov, V.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59294 **(LA—9255-MS) Petrologic studies of drill cores USW-G2 and UE25b-1H, Yucca Mountain, Nevada.** Caporuscio, F.; Vaniman, D.; Bish, D.; Broxton, D.; Arney, B.; Heiken, G.; Byers, F.; Gooley, R.; Semarge, E. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 114p. NTIS, PC A06/MF A01. Order Number DE82021846.

The tuffs of the Nevada Test Site are currently under investigation as a possible deep geologic site for high-level radioactive waste disposal. This report characterizes tuff retrieved in core from two drill holes, USW-G2 and UE25b-1H, at the Yucca Mountain block. The USW-G2 drill core is from the northernmost extent of the block, whereas UE25b-1H is adjacent to an earlier drill hole, UE25a-1. The drill cores USW-G2 and UE25b-1H bottomed at 6000 and 4200 ft, respectively. Petrographic and x-ray diffraction studies of the two drill cores are presented in this report and indicate that tuffs (composed primarily of variably welded ash flows) are partially recrystallized to secondary minerals. Correlations of stratigraphy are also made with previous drill cores from Yucca Mountain.

59295 **(LA—9409-MS) Environmental analysis of Acid/middle Pueblo Canyon, Los Alamos, New Mexico.** Ferenbaugh, R.W.; Buhl, T.E.; Stoker, A.K.; Hansen, W.R. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 105p. NTIS, PC A06/MF A01. Order Number DE82021837.

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The radiological survey of the former radioactive waste treatment plant site (TA-45), Acid Canyon, and Pueblo Canyon found residual radioactivity at the site itself and in the channel and banks of Acid, Pueblo, and lower Los Alamos Canyons, all the way to the Rio Grande. The largest reservoir of radioactive material is in lower Pueblo Canyon, which is on DOE property. The only areas where residual radioactivity exceeds the proposed cleanup criteria are at the former vehicle decontamination facility, located between the former treatment plant site and Acid Canyon, around the former untreated waste outfall and for a short distance below, and in two small areas farther down in Acid Canyon. The three alternatives proposed are (1) to take no action, (2) to fence the areas where the residual radioactivity exceeds the proposed criteria (minimal action), and (3) to clean up the former vehicle decontamination facility and around the former untreated waste outfall. Calculations based on actual measurements indicate that the annual dose at the location having the greatest residual radioactivity would be about 12% of the applicable guideline. Most doses are much smaller than that. No environmental impacts are associated with either the no-action or minimal action alternatives. The impact associated with the cleanup alternative is very small. The preferred alternative is to clean up the areas around the former vehicle decontamination facility and the untreated waste outfall. This course of action is recommended not because of any real danger associated with the residual radioactivity, but rather because the cleanup operation is a minor effort and would conform with the ALARA (as low as reasonably achievable) philosophy.

59296 **(LA-UR—82-1062) TRU waste-assay instrumentation and application in nuclear-facility decommissioning.** Umbarger, C.J. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 12p. (CONF-821005—1). NTIS, PC A02/MF A01. Order Number DE82014084.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

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The Los Alamos TRU waste assay program is developing measurement techniques for TRU and other radioactive waste materials generated by the nuclear industry, including decommissioning programs. Systems are now being fielded for test and evaluation purposes at DOE TRU waste generators. The transfer of this technology to other facilities and the commercial instrumentation sector is well in progress. 6 figures.

59297 **(MLM—2976-OP) Use of urethane foam in the decontamination and decommissioning of nuclear facilities.** Hermetz, R.E. (Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 6p. (CONF-821005—3). NTIS, PC A02/MF A01. Order Number DE82019978.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

The decontamination and decommissioning (D & D) of nuclear facilities described here is taking place at Mound Facility, an installation operated for the Department of Energy by Monsanto Research Corporation, and located in southwestern Ohio. The D & D work at Mound is underway in three areas: the Plutonium Processing Building, the Research Building, and the Waste Transfer System. All areas will be returned to a condition suitable for reallocating the area for other efforts. This work, started in 1978, is a multimillion-dollar effort scheduled to continue through 1987. Urethane foam is being used in a two-part spray system. It is used to coat interior surfaces of gloveboxes for the purpose of fixing contamination. This reduces the effort and cost of providing a safe and easily handled package. It is also used as packing material to stabilize the loads inside shipping containers. These urethane foams have proven to be cost-effective and time-saving.

59298 **(MLM—2987-OP) Ultrafiltration/reverse osmosis (liquid-treatment systems).** Bond, W.H. (Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 43p. (CONF-820854—10). NTIS, PC A03/MF A01. Order Number DE82020775.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

This project is involved with the development of low-level liquid waste treatment processes. Reverse osmosis (RO) has been found to be an effective decontamination process with a large number of radioisotopes. Fiscal year 1982 saw the conclusion of reverse osmosis development with a plant design for a 40 gal/min RO unit. Background and engineering data were included to enable an applicability assessment and rough cost estimate to be made. The removal of cobalt from aqueous solutions with adsorbents was investigated. It was found that solution pH, ammonium, and sulfite ions affect cobalt removal. The effect of these factors was measured and defined in a set of prediction equations. A design for an adsorbent pilot plant was also produced which included a process schematic, solution criteria, recommended isotope-adsorbent combinations, and cost estimates.

59299 **(MLM—2988-OP) Evaluation of a joule-heated molten-glass furnace system for waste processing.** Armstrong, K.M.; Jaeger, R.R. (Monsanto Research Corp., Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 15p. (CONF-820854—1). NTIS, PC A02/MF A01. Order Number DE82020774.

From 4. annual DOE LLWMP participant's information meeting; Denver, CO, USA (31 Aug 1982).

The joule-heated glass furnace system is currently being evaluated at Mound as a means of reducing the volume of low-level radioactive waste similar to that found in light water reactor facilities. The furnace utilizes molten soda-lime silica to initiate and support combustion of the waste feed and to serve as an immobilization matrix. Dry solid waste, filter sludge, cartridge filters, and ion exchange resin are being introduced in a series of nonradioactive experiments to determine the combustion efficiency of the furnace unit. Results of experiments on the incineration of dry solid waste have shown excellent combustion capabilities. Upon completion of the nonradioactive studies, radioisotope behavior in the burn chamber will be investigated. 7 figures, 3 tables.

59300 **(MLM—2991-OP) Mound's decommissioning experience, tooling, and techniques.** Combs, A.B.; Davis, W.P.; Elswick, T.C.; Garner, J.M.; Geichman, J.R. (Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 9p. (CONF-821005—11). NTIS, PC A02/MF A01. Order Number DE82021347.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

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Monsanto Research Corporation (MRC), which operates Mound for the Department of Energy (DOE), has been decommissioning radioactively contaminated facilities since 1949. We are currently decommissioning three plutonium-238 contaminated facilities (approximately 50,000 ft^2) that contained 1100 linear ft of gloveboxes; 900 linear ft of conveyor housing; 2650 linear ft of dual underground liquid waste lines; and associated contaminated piping, services, equipment, structures, and soil. As of June 1982, over 29,000 Ci of plutonium-238 have been removed in waste and scrap residues. As a result of the current and previous decommissioning projects, valuable experience has been gained in tooling and techniques. Special techniques have been developed in planning, exposure control, contamination control, equipment removal, structural decontamination, and waste packaging.

59301 **(NVO—196-31) Nevada Nuclear-Waste-Storage Investigations. Quarterly report, April-June 1982.** (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). Sep 1982. 94p. NTIS, PC A05/MF A01. Order Number DE82021099.

The Nevada Nuclear Waste Storage Investigations (NNWSI) are studying the Nevada Test Site (NTS) area to establish whether it would qualify as a licensable location for a commercial nuclear waste repository; determining whether specific underground rock masses in the NTS area are technically acceptable for permanently disposing of highly radioactive solid wastes; and developing and demonstrating the capability to safely handle and store commercial spent reactor fuel and high-level waste. Progress reports for the following eight tasks are presented: systems; waste package; site; repository; regulatory and institutional; test facilities; land acquisition; and program management. Some of the highlights are: A code library was established to provide a central location for documentation of repository performance assessment codes. A two-dimensional finite element code, SAGUARO, was developed for modeling saturated/unsaturated groundwater flow. The results of an initial experiment to determine canister penetration rates due to corrosion indicate the expected strong effect of toxic environmental conditions on the corrosion rate of carbon steel in tuff-conditioned water. Wells USW-H3 and USW-H4 at Yucca Mountain have been sampled for groundwater analysis. A summary characterizing and relating the mineralogy and petrology of Yucca Mountain tuffs was compiled from the findings of studies of core samples from five drill holes.

59302 **(ORNL—5880) Incentives and the siting of radioactive waste facilities.** Carnes, S.A.; Copenhaver, E.D.; Reed, J.H.; Soderstrom, E.J.; Sorensen, J.H.; Peelle, E.; Bjornstad, D.J. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 90p. NTIS, PC A05/MF A01. Order Number DE82020706.

The importance of social and institutional issues in the siting of nuclear waste facilities has been recognized in recent years. Limited evidence from a survey of rural Wisconsin residents in 1980 indicates that incentives may help achieve the twin goals of increasing local support and decreasing local opposition to hosting nuclear waste facilities. Incentives are classified according to functional categories (i.e., mitigation, compensation, and reward) and the conditions which may be prerequisites to the use of incentives are outlined (i.e., guarantee of public health and safety, some measure of local control, and a legitimation of negotiations during siting). Criteria for evaluating the utility of incentives in nuclear waste repository siting are developed. Incentive packages may be more useful than single incentives, and nonmonetary incentives, such as independent monitoring and access to credible information, may be as important in eliciting support as monetary incentives. Without careful attention to prerequisites in the siting process it is not likely that incentives will facilitate the siting process.

59303 **(ORNL/TM—8351) Evaluation of corrosion damage to materials after three years in the Avery Island salt mine.** Griess, J.C. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 24p. NTIS, PC A02/MF A01. Order Number DE82020484.

The corrosion results obtained from two heated steel pipes that had been buried in a salt mine at Avery Island, Louisiana, for about three years are reported. In addition, weight losses of corrosion specimens of several alloys attached to the outer surfaces of the pipes were also obtained, and the maximum depths of penetration were measured. The greatest attack was noted on carbon steel, particularly when the water content of the salt was high. The maximum penetration rate observed was about 1 mm/year. All other materials tested underwent much less attack than did carbon steel; titanium and Hastelloy C-276 were totally unaffected on both pipes. Minimal attack was also noted on Zircaloy-2 and type 304L stainless steel, whereas E-Brite 26-1 experienced pitting, and, at high temperatures, a more general attack on some areas. 12 figures, 5 tables.

59304 **(PNL—4089) Computed solid phases limiting the concentration of dissolved constituents in basalt aquifers of the Columbia Plateau in eastern Washington. Geochemical modeling and nuclide/rock/groundwater interaction studies.** Deutsch, W.J.; Jenne, E.A.; Krupka, K.M. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 49p. NTIS, PC A03/MF A01. Order Number DE82021962.

A speciation-solubility geochemical model, WATEQ2, was used to analyze geographically-diverse, ground-water samples from the aquifers of the Columbia Plateau basalts in eastern Washington. The ground-water samples compute to be at equilibrium with calcite, which provides both a solubility control for dissolved calcium and a pH buffer. Amorphic ferric hydroxide, $Fe(OH)_3(A)$, is at saturation or modestly oversaturated in the few water samples with measured redox potentials. Most of the ground-water samples compute to be at equilibrium with amorphic silica (glass) and wairakite, a zeolite, and are saturated to oversaturated with respect to allophane, an amorphic aluminosilicate. The water samples are saturated to undersaturated with halloysite, a clay, and are variably oversaturated with regard to other secondary clay minerals. Equilibrium between the ground water and amorphic silica presumably results from the dissolution of the glassy matrix of the basalt. The oversaturation of the clay minerals other than halloysite indicates that their rate of formation lags the dissolution rate of the basaltic glass. The modeling results indicate that metastable amorphic solids limit the concentration of dissolved silicon and suggest the same possibility for aluminum and iron, and that the processes of dissolution of basaltic glass and formation of metastable secondary minerals are continuing even though the basalts are of Miocene age. The computed solubility relations are found to agree with the known assemblages of alteration minerals in the basalt fractures and vesicles. Because the chemical reactivity of the bedrock will influence the transport of solutes in ground water, the observed solubility equilibria are important factors with regard to chemical-retention processes associated with the possible migration of nuclear waste stored in the earth's crust.

59305 **(RFP—3296) Separation of transuranic radionuclides from soil by vibratory grinding.** Stevens, J.R.; Rutherford, D.W. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 13 Aug 1982. Contract AC04-76DP03533. 16p. NTIS, PC A02/MF A01. Order Number DE82021536.

Experiments were conducted to test the effectiveness of a vibratory grinder (Roto-Finish - Spiratron ST-1) for the separation of transuranic elements such as plutonium from contaminated soil. Four scrubbing solutions were tested to add varying degrees of chemical action to the physical action of the attrition grinder. The scrub solutions were: water, aqueous NaOH - pH 12.5 (high pH solution), 2% HNO_3, 0.2% HF, 5 wt % Calgon, 2 vol % pine oil (weak acid plus surfactant), and 2N HCl (strong acid). All four scrub solutions reduced the greater than 35 mesh portion of the test soil from approximately 7000 dpm/g ^{239}Pu to approximately 30 dpm/g or less. The weak acid/surfactant and the strong acid solutions produced the best decontamination. The high pH, weak acid/surfactant, and strong acid solutions all appeared to increase the rate of decontamination as compared to water only. These experiments decontaminated 85% of the Rocky Flats soil tested to levels which could meet EPA screening levels for unrestricted use.

59306 **(RHO-BW-EV—1P) Comparison of NWTS-33(2) criteria and Basalt Waste Isolation Project screening considerations.** (Atomics International Div., Richland, WA (USA). Rockwell Hanford Operations). Aug 1981. Contract AC06-77RL01030. 23p. NTIS, PC A02/MF A01. Order Number DE82020722.

This report presents a table to illustrate the relationship between the National Waste Terminal Storage Program site qualification criteria in NWTS-33(2) and the screening considerations used by the Basalt Waste Isolation Project (BWIP) in each of the following screening steps: (1) development of guidelines and a decision theory framework for site identification; (2) assemblage and cataloging of existing data; (3) compilation of geological, hydrological, and geochemical data into integration reports; (4) screening of site characteristics using a structured process; (5) identification of five potential site localities within the Hanford Site, each locality about 50 mi^2; (6) identification of candidate sites within the Hanford Site, total area of all sites about 70 mi^2; (7) identification of a reference repository location within the Hanford Site, a total area about 18 mi^2; and (8) identification of a location for the emplacement of an exploratory shaft within the shaft pillar of the potential repository. The analysis shows the compatibility of the screening process used to identify the site of a proposed exploratory shaft in basalt with the National Waste Terminal Storage Program site qualification criteria for geologic repositories. This compatibility is especially important since the exploratory shaft site is expected to correspond with the shaft pillar of a nuclear waste repository in basalt.

59307 **(RHO-BW-SA—228P) Overview of hydrothermal testing of waste-package barrier materials at the Basalt Waste Isolation Project.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). 1982. Contract AC06-77RL01030. 20p. NTIS, PC A02/MF A01. Order Number DE82020780.

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The current Waste Package Department (WPD) hydrothermal testing program for the Basalt Waste Isolation Project (BWIP) has followed a systematic approach for the testing of waste-barrier-basalt interactions based on sequential penetration of barriers by intruding groundwaters. Present test activities in the WPD program have focused on determining radionuclide solubility limits (or steady-state conditions) of simulated waste forms and the long-term stability of waste package barriers under site-specific hydrothermal conditions. The resulting data on solution compositions and solid alteration products have been used to evaluate waste form degradation under conditions specific to a nuclear waste repository located in basalt (NWRB). Isothermal, time-invariant compositional data on sampled solutions have been coupled with realistic hydrologic flow data for near-field and far-field modeling for the calculation of meaningful radionuclide release rates. Radionuclides that are not strongly sorbed or precipitated from solution and that, therefore, may require special attention to ensure their isolation within the waste package have been identified. Taken together, these hydrothermal test data have been used to establish design requirements for waste packages located in basalt.

59308 **(SAND—82-1045C) Radiation-damage effects in nuclear-waste glasses.** Arnold, G.W. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 17p. (CONF-820864—3). NTIS, PC A02/MF A01. Order Number DE82021726.

From 4. europhysical topical conference on lattice defects in ionic crystals; Dublin, Ireland (30 Aug 1982).

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Ion implantation is a convenient means of simulating α-decay damage in nuclear waste glasses. Rutherford backscattering spectrometry and elastic recoil detection show that significant near-surface compositional changes can occur in leached Pb-ion implanted borosilicate glasses. In addition, the rates and mechanisms for hydration, ion exchange, and network dissolution depend upon the glass composition. A critical ion energy deposition value has been noted at which major changes concur in near-surface elemental profiles of some leached implanted glasses. An interpretation of this latter effect, based on ion-track overlap and consequent plastic flow, is advanced.

59309 **(UCID—19492) Leaching study of PNL 76-68 glass beads using the LLNL continuous-flow method and the PNL-modified IAEA method. Final report.** Buddemeier, R.W.; Coles, D.G.; Mensing, R.W.; Rego, J.; Weed, H.C. (Lawrence Livermore National Lab., CA (USA)). 20 Aug 1982. Contract W-7405-ENG-48. 257p. NTIS, PC A12/MF A01. Order Number DE82021539.

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Lawrence Livermore National Laboratory (LLNL) has conducted a long-term single-pass continuous-flow (SPCF) leaching test of the glass waste form PNL 76-68. Leaching rates of Np, Pu, and various stable elements were measured at 25° and 75°C with three different solutions and three different flow rates. The purposes of the study were: (1) to compare SPCF leaching results with the results of a modified IAEA leach test performed by Pacific Northwest Laboratories (PNL); (2) to establish elemental leach rates and their variation with temperature, flow rate and solution composition; and (3) to gain insight into the leaching mechanisms. The LLNL and PNL leach tests yielded results which appear to agree within experimental uncertainties. The magnitude of the leach rates determined for Np and the glass matrix elements is 10^{-5} grams of glass/cm^2 geometric solid surface area/day. The rates increase with temperature and with solution flow rate, and are similar in brine and distilled water but higher in a bicarbonate solution. Other cations exhibit somewhat different behavior, and Pu in particular yields a much lower apparent leach rate, probably because of sorption or precipitation effects after release from the glass matrix. After the initial few days, most elements are leached at a constant rate. Matrix dissolution appears to be the most probable rate controlling step for the leaching of most elements.

59310 **(UCID—19496) Redox calcination study of Synroc D powder containing simulated SRL waste.** Chen, C. (Lawrence Livermore National Lab., CA (USA)). 27 Jul 1982. Contract W-7405-ENG-48. 16p. NTIS, PC A02/MF A01. Order Number DE82021550.

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According to Ringwood [A.E. Ringwood, W. Sinclair, and G.M. McLaughlin, Nuclear Waste Immobilization, Lawrence Livermore Laboratory, Livermore, Rept. UCRL-15147 (1979)], the iron oxidation state is important in controlling, the spinel mineralogy and composition if the amount of titania (TiO_2) consumed in spinel formation is to be minimized in favor of the formation of the Synroc phases, zirconolite, perovskite, and nepheline. In our redox calcination studies we observed that the iron oxidation state of FeO/Fe_2O_3 can be controlled by the redoxcalcining atmosphere. In a CO atmosphere, the oxidation state was reduced to less than 7 wt % Fe_2O_3. With appropriate CO_2/CO gas mixtures the resultant iron oxidation states were in the range of 45 to 59 wt % Fe_2O_3. Direct rotary redox calcination of spray dried powder at 600°C, without prior air calcination, showed increased redox efficiency when compared to powder that had been previously air calcined at 650°C. We believe this is caused by a reduction in particle size. Rotary cal-

cination at 800°C in argon has no measurable reduction affect on the iron oxidation state of Synroc D powder.

59311 **(UCRL—53188-81) Nuclear waste-form risk assessment for US Defense waste at Savannah River Plant. Annual report FY 1981.** Cheung, H.; Edwards, L.L.; Harvey, T.F.; Jackson, D.D.; Revelli, M.A. (Lawrence Livermore National Lab., CA (USA)). Dec 1981. Contract W-7405-ENG-48. 78p. NTIS, PC A05/MF A01. Order Number DE82020575.

Savannah River Plant has been supporting the Lawrence Livermore National Laboratory in its present effort to perform risk assessments of alternative waste forms for defense waste. This effort relates to choosing a suitable combination of solid form and geologic medium on the basis of risk of exposure to future generations; therefore, the focus is on post-closure considerations of deep geologic repositories. The waste forms being investigated include borosilicate glass, SYNROC, and others. Geologic media under consideration are bedded salt, basalt, and tuff. The results of our work during FY 1981 are presented in this, our second annual report. The two complementary tasks that comprise our program, analysis of waste-form dissolution and risk assessment, are described.

59312 **(UCRL—86582) Nuclear-waste disposal in geologic repositories.** Isherwood, D. (Lawrence Livermore National Lab., CA (USA)). 2 Aug 1982. Contract W-7405-ENG-48. 17p. (CONF-820154—1). NTIS, PC A02/MF A01. Order Number DE82020176.

From Society of Civil Engineers conference on geotechnics of waste management; Philadelphia, PA, USA (19 Jan 1982).

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Deep geologic repositories are being widely studied as the most favored method of disposal of nuclear waste. Scientists search for repository sites in salt, basalt, tuff and granite that are geologically and hydrologically suitable. The systematic evaluation of the safety and reliability of deep geologic disposal centers around the concept of interacting multiple barriers. The simplest element to describe of the geologic barrier is the physical isolation of the waste in a remote region at some depth within the rock unit. Of greater complexity is the hydrologic barrier which is determined by the waste dilution factors and groundwater flow rates. The least understood is the geochemical barrier, identified as a series of waste/water/rock interactions involving sorption, membrane filtration, precipitation and complexing. In addition to the natural barriers are the engineered barriers, which include the waste form and waste package. The relative effectiveness of these barriers to provide long-term isolation of nuclear waste from the human environment is being assessed through the use of analytical and numerical models. The data used in the models is generally adequate for parameter sensitivity studies which bound the uncertainties in the release and transport predictions; however, much of the data comes from laboratory testing, and the problem of correlating laboratory and field measurements has not been resolved. Although safety assessments based on generic sites have been useful in the past for developing site selection criteria, site-specific studies are needed to judge the suitability of a particular host rock and its environment.

59313 **(UNI-SA—95) United States Department of Energy surplus facilities management program.** Nemec, J.F.; White, J.D. (UNC Nuclear Industries, Inc., Richland, WA (USA); Department of Energy, Richland, WA (USA). Richland Operations Office). 17 Aug 1982. Contract AC06-76RL01857. 14p. (CONF-820933—2). NTIS, PC A02/MF A01. Order Number DE82020524.

From International conference on radioactive waste management; Winnipeg, Manitoba, Canada (12 Sep 1982).

Many nuclear facilities that were used throughout the early development of nuclear energy have no current use and have been retired. However, these facilities have residual radioactive contamination levels requiring controls. Under the authority of the Atomic Energy Act, as amended, the United States Department of Energy established the Remedial Action Program to assure the safe caretaking and disposal (decommissioning) of such facilities. About 500 government-owned facilities requiring remedial action have been identified and catalogued - approximately 75% of which are located on the Hanford Site in eastern Washington State. The United States Department of Energy Richland Operations Office is responsible for administering this program.

59314 **Data base needs and functions: national planning.** Mastel, E.F. (U.S. Department of Energy, Washington, D.C. 20545). *Transactions of the American Nuclear Society;* **41**: 80(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59315 **Integrated data base projections.** Forsberg, C.W.; Alexander, C.W.; Morrison, W.G. (Oak Ridge National Laboratory, Oak Ridge, TN 37830.). *Transactions of the American Nuclear Society;* **41**: 83(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59316 **RAWSYM-radioactive waste management system.** Mcleod, N.B.; Park, Y.M. (NUS Corporation, 910 Clopper Road, Gaithersburg, MD 20878.). *Transactions of the American Nuclear Society;* **41**: 84(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59317 **Engineered components for spent fuel radioactive waste isolation systems-are they technically justified.** Burkholder, H.C. (Battelle Memorial Institute, Office of Nuclear Waste Isolation, 505 King Avenue, Columbus, OH 43201). *Transactions of the American Nuclear Society;* **41**: 227-228(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59318 **High-level waste disposalitechnical and institutional siting factors remaining to be resolved.** Newcomb, W.E. (Battelle Memorial Institute, Office of Nuclear Waste Isolation, 505 King Avenue, Columbus, OH 43201). *Transactions of the American Nuclear Society;* **41**: 229(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59319 **Models and risk from high-level waste disposal-the missing pieces.** Kocher, D.C. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **41**: 232(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59320 **(NUREG/CR—2192-Vol.1-Nos.3-4) Evaluation of isotope migration - land burial. Water chemistry at commercially operated low-level radioactive waste disposal sites. Quarterly progress report, October-December 1981.** Pietrzak, R.F.; Dayal, R. (Brookhaven National Lab., Upton, NY (USA)). May 1982. Contract AC02-76CH00016. 41p. (BNL-NUREG—51409-Vol.1-Nos.3-4). NTIS, PC A03/MF A01 - GPO.

Portions of document are illegible.

In this report we present field measurements of trench water properties conducted during the October 1981 sampling trip to Maxey Flats. In-line measurements of specific conductance, dissolved oxygen Eh, pH, sulfide electrode response and temperature are reported. Radionuclide sorption isotherms were evaluated for two Barnwell trench waters and sediment from the Hawthorne formation. The sorption data for ^{241}Am, ^{85}Sr, and $^{134\ 137}Cs$ could be represented by the linear isotherm which defines K/sub d/. Sorption data for ^{60}Co could not be described completely by either the linear or Freundlich isotherm. Only a minimum value for the sorption coefficient, K/sub d/, could be calculated. Comparison of ^{60}Co K/sub d/ data, based on batch sorption test using actual trench water and column loop test using synthetic water, indicates that in-situ complexing agents may be responsible for the lower ^{60}Co sorption results obtained by the isotherm method. Laboratory experiments to study the chemical changes and the coprecipitation

of radionuclides by ferric hydroxide formed during the oxidation of Maxey Flats and West Valley trench waters were made. During the oxidation of a trench 27 water from Maxey Flats, approximately 80% of the iron and all of the ^{137}Cs, ^{85}Sr, and ^{60}Co remained in solution. In similar experiments with a West Valley trench 8 water, essentially all of the iron precipitated but approximately 80% of the ^{60}Co and all of the ^{137}Cs and ^{85}Sr remained in solution.

59321 **Process for treating fission waste.** Rohrmann, C.A.; Wick, O.J. (to Dept. of Energy). US Patent Application 322,144. 17 Nov 1981. 11p. Contract AC06-76RL01830.

A method is described for the treatment of fission waste. A glass forming agent, a metal oxide, and a reducing agent are mixed with the fission waste and the mixture is heated. After melting, the mixture separates into a glass phase and a metal phase. The glass phase may be used to safely store the fission waste, while the metal phase contains noble metals recovered from the fission waste.

59322 **(PB—82-190950) Storage of HLW in engineered structures: air-cooled and water-cooled concepts. Final report.** Ahner, S.; Dekais, J.J.; Puttke, B.; Staner, P. (Commission of the European Communities, Luxembourg). [nd]. 149p. (EUR—7340-EN). NTIS PC E06/MF E06.

The conceptual designs of air-cooled (1) and water-cooled (2) intermediate storage facilities for vitrified, high-level radioactive waste in overground installations were studied. In (1) the decay heat from the storage area would be removed by natural convection, in (2) by a primary and secondary forced cooling system with redundant and diverse devices. A safety analysis and an economic analysis was applied to both concepts. Construction costs for both systems differ little, but operation and maintenance costs for (2) are higher than for (1). The study used criteria which in certain Member States of the European Community could result in a higher standard of safety than might be justified on social, political, or economic grounds.

59323 **(RHO-BW-SA—231A-P) Status report on the full-scale electric-heater tests at the Hanford Near-Surface Test Facility.** Baxter, J.T.; Cunningham, J.P.; Gregory, E.C.; Jimenez, R.F.; Topcubasi, A.F. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations; Kaiser Engineers, Oakland, CA (USA); Parsons, Brinckerhoff, Quade and Douglas, Inc., San Francisco, CA (USA)). [nd]. Contract AC06-77RL01030. 26p. NTIS, PC A03/MF A01. Order Number DE82019256.

Portions of document are illegible.

Purpose of the NSTF was to evaluate the thermomechanical response of basalt subjected to thermal loads, such as from high-level radioactive wastes in canisters. Prior to test startup, the response was modeled using DAMSWEL and a bilinear model. It was concluded that the response can be modeled satisfactorily on the canister or very near-field scale. The agreement for horizontal displacements is not as good as for vertical displacements. Rock temperature was $> 400°C$ at start of simulated cooldown, has been $> 300°C$ for 30 days. No appreciable boreholes decrepitation or thermal cracking has been observed. 23 figures. (DLC)

59324 (INIS-mf—7118, pp v) **Geological investigations concerning the possible use of the iron ore mine KONRAD for the final storage of radioactive wastes.** Brewitz, W.; Gommlich, G.; Rabsilber, K. [nd]. (In German). Dep. NTIS (US Sales Only).

From 133. general meeting of the Deutsche Geologische Gesellschaft; Clausthal-Zellerfeld, F.R. Germany (16 Sep 1981).

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 59275, 59295, 59307, 59311, 59319, 59320, 60165, 60166, 60185

59325 **(DOE/EA—0128) Environmental assessment of the properties adjacent to and nearby the former Middlesex Sampling Plant, Middlesex, New Jersey.** (Department of Energy, Washington, DC (USA). Assistant Secretary for Nuclear Energy). Oct 1980. 63p. NTIS, PC A04/MF A01. Order Number DE82021585.

The purpose of this Environmental Assessment is to present the environmental consequences of implementing a radioactive decontamination and restoration action on the contaminated properties adjacent to and nearby the Middlesex Sampling Plant site. The alternatives are also briefly reviewed. This report describes the proposed action as well as the alternatives which have been considered previously. The physical and socioeconomical aspects of the present environment which would be affected by the action are described. Also described in the report are: the impacts due to current conditions, those which would result during the remedial action, and those which would result after the action is completed. (DMC)

59326 **(LBL—14486) Hydro-geochemical studies of uranium mill tailing piles at Riverton, Wyoming and Maybell, Colorado. Annual report for FY 1981.** Narasimhan, T.N.; Galbraith, R.M.; White, A.; Smith, A.; Schmidt, H.; Moed, B.; Tokunaga, T. (Lawrence Berkeley Lab., CA (USA)). May 1982. Contract AC03-76SF00098. 113p. NTIS, PC A06/MF A01. Order Number DE82020572.

Portions of document are illegible.

The present study is the beginning phase of an effort to develop an understanding of the physico-chemical interactions that occur within two typical inactive uranium mill tailing piles under the jurisdiction of the UMTRA Program. These sites are located at Riverton, Wyoming and at Maybell, Colorado. The understanding is to be gained through integrated hydrological-geochemical-radiometric studies. Investigated are: (a) the release of contaminants to the interstitial fluid; and (b) the vertical transport of the contaminants either upward to the surface or downward to the water table. This investigation would determine the important contaminants, ascertain the influence of chemical/osmotic potentials (if any) on fluid movement, and investigate the possibility of temporal cycles in the upward/downward movement of fluids with seasonal changes in the moisture content of the piles. The field work carried out during fiscal 1981 extended from June to September. During this period, exploratory drilling was completed at six locations on the Riverton and Maybell piles. Over 141 Shelby tube samples were collected, which represent relatively undisturbed core samples of the tailings material. In order to gain a maximum advantage of the short time available before the onset of the winter, it was decided to concentrate the rest of the data collection at the Riverton site, where the water table is shallow.

59327 **(NUREG/CR—1030-Vol.3) Sediment and radionuclide transport in rivers. Phase 3. Field sampling program for Cattaraugus and Buttermilk Creeks, New York.** Ecker, R.M.; Walters, W.H.; Onishi, Y. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 233p. (PNL—3117-Vol.3). NTIS, PC A11/MF A01 - GPO $7.50.

A field sampling program was conducted on Cattaraugus and Buttermilk Creeks, New York during April 1979 to investigate the transport of radionuclides in surface waters as part of a continuing program to provide data for application and verification of Pacific Northwest Laboratory's (PNL) sediment and radionuclide transport model, SERATRA. Bed sediment, suspended sediment and water samples were collected during unsteady flow conditions over a 45 mile reach of stream channel. Radiological analysis of these samples included gamma ray spectrometry analysis, and radiochemical separation and analysis of Sr-90, Pu-238, Pu-239, 240, Am-241 and Cm-244. Tritium analysis was also performed on water samples. Based on the evaluation of radionuclide levels in Cattaraugus and Buttermilk Creeks, the Nuclear Fuel Services facility at West Valley, New York, may be the source of Cs-137, Sr-90, Cs-134, Co-60, Pu-238, Pu-239, 240, Am-241, Cm-244 and tritium found in the bed sediment, suspended sediment and water of Buttermilk and Cattaraugus Creeks. This field sampling effort was the last of a three phase program to collect hydrologic and radiologic data at different flow conditions.

0540 Health And Safety

REFER ALSO TO CITATION(S) 59258, 59261, 59275, 59276, 59300, 59311, 59317, 59319, 60233, 60242

59328 (LA-UR—82-1279) Radiological planning and implementation for nuclear-facility decommissioning. Valentine, A.M. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 8p. (CONF-821005—2). NTIS, PC A02/MF A01. Order Number DE82015812.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

The need and scope of radiological planning required to support nuclear facility decommissioning are issues addressed in this paper. The role of radiation protection engineering and monitoring professionals during project implementation and closeout is also addressed. Most of the discussion focuses on worker protection considerations; however, project support, environmental protection and site release certification considerations are also covered. One objective is to identify radiological safety issues that must be addressed. The importance of the issues will vary depending on the type of facility being decommissioned; however, by giving appropriate attention to these issues difficult decommissioning projects can be accomplished in a safer manner with workers and the public receiving minimal radiation exposures.

59329 (UNI-SA—102) Evaluation of nuclear facility decommissioning projects program. Miller, R.L. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 12 Aug 1982. Contract AC06-76RL01857. 8p. (CONF-821005—6). NTIS, PC A02/MF A01. Order Number DE82020523.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

The program is being undertaken by the NRC to compile and evaluate the activities of ongoing decommissioning projects. The program has been separated into the following tasks: program management, identification of facilities, collection of data, analysis and reporting of field data, and summary comparisons and evaluations. A computerized data collection system, has been developed which incorporates information related to the following: facility classification, predecommissioning engineering, radionuclide inventory and dose assessment, ALARA efforts, waste disposition, and decommissioning technology.

0550 Regulations

REFER ALSO TO CITATION(S) 59258, 59271, 59591

59330 (INIS-mf—6937, pp vp) **Homogeneity of randomly loaded rad-waste containers.** Ben-Haim, Y.; Elias, E. (Technion-Israel Inst. of Tech., Haifa. Dept. of Nuclear Engineering). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beersheba, Israel (4 Dec 1980).

59331 (LA—9238-MS) Robust estimation of standard deviation using ordered samples. Beedgen, R. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 22p. NTIS, PC A02/MF A01. Order Number DE82021842.

A robust estimate for the standard deviation of a normal distribution is developed. We choose the contaminated normal distribution as our outlier model and demonstrate the method with two examples representing data from international interlaboratory experiments.

59332 (LA—9246-M) User's manual for a measurement simulation code. Kern, E.A. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 149p. NTIS, PC A07/MF A01. Order Number DE82021850.

Portions of document are illegible.

The MEASIM code has been developed primarily for modeling process measurements in materials processing facilities associated with the nuclear fuel cycle. In addition, the code computes materials balances and the summation of materials balances along with associated variances. The code has been used primarily in performance assessment of materials' accounting systems. This report provides the necessary information for a potential user to employ the code in these applications. A number of examples that demonstrate most of the capabilities of the code are provided.

59333 (LA—9343) Production of actinide isotopes in simulated PWR fuel and their influence on inherent neutron emission. Bosler, G.E.; Phillips, J.R.; Wilson, W.B.; LaBauve, R.J.; England, T.R. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 113p. NTIS, PC A06/MF A01. Order Number DE82021849.

This report describes calculations that examine the sensitivity of actinide isotopes to various reactor parameters. The impact of actinide isotope build-up, depletion, and decay on the neutron source rate in a spent-fuel assembly is determined, and correlations between neutron source rates and spent-fuel characteristics such as exposure, fissile content, and plutonium content are established. The application of calculations for evaluating experimental results is discussed.

59334 (NUREG/CR—2404) Analyzing safeguards alarms and response decisions. Al-Ayat, R.A.; Judd, B.R.; McCord, R.K. (Lawrence Livermore National Lab., CA (USA); Applied Decision Analysis, Inc., Menlo Park, CA (USA)). Jan 1982. Contract W-7405-ENG-48. 106p. (UCRL—53034). NTIS, PC A06/MF A01 - GPO.

This report describes a quantitative model designed to help the Nuclear Regulatory Commission (NRC) and its licensees evaluate and respond to alarms indicating that special nuclear material (SNM) may be missing. The model is called the Alarm/Response (A/R) Model. The report demonstrates three principal uses of the A/R Model. The first is determining the most likely cause of an alarm - theft, hoax, or error. The second is evaluating alternative responses to alarms. Possible responses include conducting investigations, initiating measures to recover stolen SNM, and replying to extortion threats from individuals claiming to possess SNM. For each possible alarm, the model identifies the best response, which can be used to develop contingency plans that the licensee and the NRC can carry out. The third use is to assist the NRC in setting performance standards, especially detection time requirements. In this application, the model helps to determine the value of more timely alarms produced by licensee safeguards systems. All three uses are demonstrated with hypothetical examples. A preliminary computer code produced sample results and determined the sensitivity of those results to subjective factors in the example.

59335 (NUREG/CR—2538) Controllable-unit approach: an application manual. Rudy, C.R.; Armstrong, D.B.; Foster, K.W.; Rogers, D.R.; Hill, D.R. (Mound Facility, Miamisburg, OH (USA)). 27 Jun 1982. Contract AC04-76DP00053. 106p. (MLM—2881). NTIS, PC A06/MF A01.

Purpose of this manual is to provide potential users of the CUA Methodology with a step-by-step plan for designing, evaluating, and implementing a Material Control and Accounting (MC & A) system required to meet an absolute performance criterion. The steps needed to integrate the process steps and process measurements into an initial, model system are outlined. The verification of the prototype system is discussed. During this phase, data are collected from the operating system from points specified by CUA. If the plant is still being designed, then the verification phase can be skipped for the initial evaluation of the system. Assumptions that were made in the modeling phase are tested for validity, and model refinements are made if necessary. To determine whether the system is meeting the performance criteria, certain statistical tests are made. The system is evaluated against potential diversion strategies, both simple and complex. If the performance criteria cannot be met with the prototype MC & A system, refinements that may be used to bring it within compliance form the subject matter of Chapter 4. Finally, the implementation and control are discussed in Chapter 5.

59336 (PNL—4383) Calculation of parameters for inspection planning and evaluation: mixed-oxide fuel fabrication facilities. Reardon, P.T.; Mullen, M.F. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 82p. (ISPO—161). NTIS, PC A05/MF A01. Order Number DE82021965.

As part of Task C.35 (Calculation of Parameters for Inspection Planning and Evaluation) of the US Program of Technical Assistance to IAEA Safeguards, Pacific Northwest Laboratory has performed some quantitative analyses of IAEA inspection activities for mixed-oxide fuel fabrication facilities. There were four distinct efforts involved in this task. These were as follows: show the effect on a material balance verification of using two variables measurement methods in some strata; perform additional calculations for the reference facility described in STR-89; modify the INSPECT computer programs to be used as an after-inspection analysis tool, as well as a preinspection planning tool; provide written comments and explantations of text and graphs of the first draft of STR-89, Safeguards Considerations for Mixed-Oxide Fuel Element Fabrication Facilities, by W. Bahm, T. Shea, and D. Tolchenkov, System Studies Section, IAEA.

59337 **Management organization and administration for ALARA.** Kathren, R.L. (Pacific Northwest Lab., Richland, WA (USA)). *Health Physics;* **42**: No. 2, 119-131(Feb 1982).

The fundamentals of organizational structure and administration as applied to the goal of keeping occupational radiation exposures as low as reasonably achievable are discussed, including consideration of management commitment, organizational separation of health physics functions, reporting levels, designation of responsibility and authority and adequacy of personnel and funding. Examples of good and poor organizational structures are shown, and the role and implementation of ALARA committees, effective communications, and review and audit processes are discussed.

59338 **Security seal.** Gobeli, G.W. (to Dept. of Energy). US Patent Application 322,143. 17 Nov 1981. 17p. Contract AC04-76DP00789.

Security for a package or verifying seal in plastic material is provided by a print seal with unique thermally produced imprints in the plastic. If tampering is attempted, the material is irreparably damaged and thus detectable. The pattern of the imprints, similar to fingerprints are recorded as a positive identification for the seal, and corresponding recordings made to allow comparison. The integrity of the seal is proved by the comparison of imprint identification records made by laser beam projection.

06 FUSION FUELS

0602 Processing

REFER ALSO TO CITATION(S) 59847, 59854

0603 By-products

59339 **System for thermochemical hydrogen production.** Werner, R.W.; Galloway, T.R.; Krikorian, O.H. (to Dept. of Energy). US Patent Application 266,248. 22 May 1981. 17p. Contract W-7405-ENG-48.

Method and apparatus are described for joule boosting a SO_3 decomposer using electrical instead of thermal energy to heat the reactants of the high temperature SO_3 decomposition step of a thermochemical hydrogen production process driven by a tandem mirror reactor. Joule boosting the decomposer to a sufficiently high temperature from a lower temperature heat source eliminates the need for expensive catalysts and reduces the temperature and consequent materials requirements for the reactor blanket. A particular decomposer design utilizes electrically heated silicon carbide rods, at a temperature of 1250°K, to decompose a cross flow of SO_3 gas.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0702 Radiation Sources

REFER ALSO TO CITATION(S) 60037

59340 **(AD-A—112340/5) A data acquisition and instrument control system for laboratory tests of an ion beam source. Instrumentation papers.** Broomhead, K.; Chesley, A.; Boucher, R. (Air Force Geophysics Lab., Hanscom AFB, MA (USA)). 17 Sep 1981. 34p. (AFGL-TR—81-0264; AFGL-IP—305). NTIS, PC A03/MF A01.

During the 1970's, the Air Force developed an ion beam source for use in spacecraft discharging experiments. In addition to the flight instruments, several models were developed for laboratory tests conducted at the Air Force Geophysics Laboratory. Over the past several years, the research methods used for the Satellite Positive Ion Beam System (SPIBS) tests have evolved from manual techniques for experiment control and data recording to the present use of a real-time, computer-based system.

59341 **(IAEA-R—1626-F) Development and improvement of radioactive methods for tribiological researches on elements of tools, machines and devices. Final report for the period 1 July 1975 - 31 July 1978.** Ivkovic, B. (International Atomic Energy Agency, Vienna (Austria)). Feb 1979. 3p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702366.

Charged particle activation analysis based on the bombardment with 15MeV protons from cyclotron was used to study the friction wearing at the zone of contacts in cutting tools, roller bearings and gear teeth. The radioactivity of resulting isotopes such as Co-56, Co-58, Re-183 serves as a measure of the mass changes on the surface tools. The method is suitable for studying the parameters effecting wearing processes and the role of cutting fluid, and also to envisage the economic factors in production planning.

59342 (INIS-mf—6311, pp 109-117) **Isotopic method of investigations of the cavitation wear of cylinder sleeves of diesel motors.** Zhukovska-Tsvink, G.; Babasik, Z.; Kras', Ya. (Institute of Nuclear Research, Warsaw (Poland)); Sitnik, L. 1979. (In Russian). NTIS (US Sales Only).

From Symposium on the radioisotope methods application in industry, including means of control and operation; Leipzig, German Democratic Republic (26 Sep 1978).

Lifetime of diesel motors is limited to the great extent by the strength of the material used for manufacturing of the cylinder sleeves. Wear of the inner surface of cylinder, as a rule, is considerably less than the damage appearing on the outer surface of a cylinder sleeve which is permanently in the contact with cooling water. The reason for these damages is simultaneous influence of corrosion, erosion and cavitation processes, which in total is called as cavitation wear. In the isotope method applied for investigation of the cavitation wear, principle of zone activation is used based on application of screens, made of cadmium plates, during irradiation of cylinder sleeves by thermal neutrons in nuclear reactor. The mass of the particles, produced as a result of the cavitation wear, was determined by means of comparative measurements of particles containing radioactive indicator, detained by the measuring filter, and known mass of these particles in standard system. Conditions of the motor's operation and values of the influencing factors have been selected according to experiment planning methods. The results of experiment interpreted by the method of least squares fit to exponential curves permit conclusions about the degree of influence of separate factors on the intensity of wear of cylinder sleeves.

59343 (INIS-mf—6311, pp 118-125) **Analysis of the material's expenditure of electric contacts by means of the isotopic method.** Farkash, K. (Magyar Tudomanyos Akademia Izotop Intezete, Budapest). 1979. (In Russian). NTIS (US Sales Only).

From Symposium on the radioisotope methods application in industry, including means of control and operation; Leipzig, German Democratic Republic (26 Sep 1978).

To investigate lifetime of the weak-current and heavy-current contacts different radioisotopic methods have been developed. Advantages of the radioisotopic methods as compared with other

methods of testing consists of the fact that due to their sensitivity they permit to determine low expense of material; permit to determine quantitatively expense of each element separately from the elements, composing the contacts alloy; by means of these methods it is possible to evaluate quantitatively topological distribution of the matter separated from the contacts into the environment; it is possible to determine morphological characteristics of the matter separated from the contact. During investigation of the lifetime of contacts there were determined: value of the expense of the material of contacts; composition the material of contacts; composition of the matter separated from the contact; distribution of the separated matter depending on the electrical parameters and number of the closings of contact in the case of different compositions of contacts and in different conditions. Strength of the contacts' alloys related to the electrical load was investigated at the special stand.

59344 (INIS-mf—7057, pp 316-319) **Investigation of salt transport in sand-soils by radioabsorption method.** Varro, T.; Madi, I. (Kossuth Lajos Tudomanyegyetem, Debrecen (Hungary). Izotop Lab.); Kazo, B.; Kocsis, I.; Karuczka, A. (Debreceni Agrartudomanyi Egyetem Kutato Intezete, Karcag (Hungary)). 1981. (In Hungarian). NTIS (US Sales Only), PC A16/MF A01.

From Conference on colloid chemistry; Siofok, Hungary (13 Apr 1981).

The transport process of potassium and phosphate ions in sand-soils has been studied by radioabsorption method. The effective diffusion coefficient and the activation energy of transport processes were determined. The influence of zeolite-lignite suspension on the transport process in acidic and calciferous sand-soils has been investigated. The interaction between the soils and the zeolite-lignite suspension was studied by electronmicroscopic photography. (author).

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 59339, 60208

0808 Properties

59345 **The embrittling effects of hydrogen on a variety of inorganic materials as indicated by acoustic emission.** Cuthrell, R.E.; Randich, E. (Sandia Laboratories, Albuquerque, N. Mex.). *Journal of Materials Science;* **14**: 2563-2566(Nov 1979). Contract AC04-76DP00789.

The embrittling effects of hydrogen-bearing environments which were previously shown in detail for a few selected materials, are reported here for a wide variety of inorganic solids including glasses, ceramics, single crystal minerals, rocks, refractory coatings, semiconductors, and metals. Prior work showed the hydrogen effect using several quite different techniques and environments. The measurements for the present survey were restricted to acoustic emission amplitude distributions during drilling under carbon tetrachloride (a hydrogen-free liquid environment) and under water (a source of hydrogen). It is proposed that the hydrogen effect is a universal phenomenon which affects the deformation and fracture behaviour of solids (organic materials may be exceptions).

0809 Environmental Aspects

REFER ALSO TO CITATION(S) 59706

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 59114, 59121, 59130, 59184, 59357, 59363, 59365, 59688, 59705, 59958, 59960

59346 **(PB—82-199043) Gasification kinetics for biomass decomposition. Annual report Jul 80-Jun 81.** Simmons, G.M.; Ramachandran, S.; Lee, W. (Idaho Univ., Moscow (USA)). Jul 1981. 36p. NTIS, PC A03/MF A01.

An extensive literature review has been completed on the thermal decomposition of cellulose and wood. From this review, and from our own experimental data, a possible reaction path has been proposed. Experimental decomposition experiments which determine the rate of gas formation, as opposed to weight loss, have identified at least two separate rate constants which are consistent with the suggestion of competing reactions. Future work will incorporate detailed modeling of transport processes to ascertain the limits and dependencies of reactor rates on heat and mass transfer.

59347 **Fixed-bed, anaerobic treatment of wastewater for energy conservation and methane production.** Scott, C.D.; Genung, R.K. (Chem Technol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830 USA). *Proceedings, Intersociety Energy Conversion Engineering Conference;* **1**: 583-585(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Anaerobic packed-bed bioreactors that use fixed films of microorganisms are under development as alternative wastewater treatment systems which have reduced operating costs and energy consumption. Major economic advantages of such systems are the elimination of the requirements for aeration and a significant decrease of the sludge-handling requirements as compared with activated sludge treatment systems. CH_4 is a byproduct and can be recovered to decrease energy requirements and costs. The fixed-film systems also are less affected by shock loading of toxic materials. Development has progressed through the laboratory and pilot scales. Systems based on a 1.5 m-diam bioreactor were continuously operated for 2 years at hydraulic loading rates of greater than 0.008 cu.m/sq.m-min. The operation of a recently installed 190 cu.m per day pilot plant based on a 4.8 m-diam bioreactor began in June 1981.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 59660, 59697, 59707

59348 **(DOE/PC/30019—T3) Liquid phase methanol process development unit: installation, operation, and support studies. Technical progress report No. 3, 1 April 1982-30 June 1982.** (Air Products and Chemicals, Inc., Allentown, PA (USA); Chem Systems, Inc., Tarrytown, NY (USA)). 20 Jul 1982. Contract AC22-81PC30019. 231p. NTIS, PC A11/MF A01. Order Number DE82017196.

Portions of document are illegible.

This project is aimed to further develop the LPMeOH process invented by Chem Systems Inc. (CSI). Progress for the quarter ending June 1982 is reported. The program is divided into 11 major tasks which are phases to allow progress review and approval to proceed. The 11 major tasks are: Program Planning; Engineering and Design Specifications; Equipment Procurement; LPM Unit Relocation/Inspection; LaPorte LPMeOH PDU Renovation, Installation and Shakedown; Liquid-Fluidized (Ebullated Bed) Operation; Laboratory Support Program; Conversion of LaPorte LPMeOH PDU from Liquid-Fluidized (Ebullated Bed) to Liquid-Entrained (Slurry) Mode; Shakedown of Liquid-Entrained (Slurry) Operation; Liquid-Entrained (Slurry) Operation; and Project Evaluation.

59349 **(DOE/RA/50323—1-Vol.4) Feasibility study for Hilo Coast Processing Company, Pepeekeo, Hawaii: 11.4-million gallon-per-year motor-fuel-grade ethanol plant. Volume IV. Process design.** Messick, J.R.; Kaupisch, K.F.; Yeats, C.; Hicks, H.W.; Wagner, R.C.; Moon, G.D.; Katzen, R. (Katzen (Raphael) Associates, Cincinnati, OH (USA)). May 1981. Contract FG07-80RA50323. 158p. NTIS (US Sales Only). Order Number DE82018298.

Portions of document are illegible.

A study to determine the technial and economic feasibility for the construction and operation of an 11.4 million gallon per year fuel grade ethanol plant in Pepeekeo, Hawaii, has been conducted. This volume contains the following appendices concerning process design: vendor's list; analytical procedures; molasses analysis and fermentation test procedures from HSPA; fermentation test procedures; soils report summary; by-product recovery analysis; preliminary investment estimate; stillage composition; materials of construction memorandum. (DMC)

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 59358

13 HYDRO ENERGY

59350 **(DOE/ID—12126) Shawmut hydroelectric redevelopment project. Final technical and construction cost report.** (Central Maine Power Co., Augusta (USA)). Aug 1982. Contract FC07-80ID12126. 96p. NTIS, PC A05/MF A01. Order Number DE82021007.

This report describes the major steps undertaken by the Central Maine Power Company to redevelop an old existing lowhead (19 to 23 ft) hydroelectric station and, at the same time, demonstrate the commercial viability of such a venture. The report addresses the process of site selection, preliminary conceptual design for determining economic viability, licensing and the regulatory process, final design, and project construction with the objective of presenting to the reader a technical and economical guide useful for a similar undertaking.

1301 Resources And Availability

59351 **(PB—82-184953) Modular small hydro configuration.** (Fraser (J.Kenneth) and Associates, Rensselaer, NY (USA)). Sep 1981. 195p. NTIS, PC A09/MF A01.

The Modular Small Hydro Configuration has been conceived and structured to address a selected fraction of the overall hydropower development market. In particular, smaller sites - those under 750 kilowatts, which previously were not attractive to develop using equipment intended for application at larger scale sites, have been the focal point in the conception of this system. This system utilizes standard industrial components which are generally available within short procurement times. Such components have been integrated into a development scheme for sites having 20 feet to 150 feet of head. The Modular Small Hydro Configuration maximizes the use of available components and minimizes modification of existing civil works. A key aspect of the development concept is the use of a vertical turbine multi-stage pump, used in the reverse mode as a hydraulic turbine. The configuration allows for automated operation and control of the hydroelectric facilities with sufficient flexibility for inclusion of potential hydroelectric sites into dispersed storage and generation (DSG) utility grid systems.

59352 **(WAOENG—81-18) Inventory of dams in the state of Washington.** (Washington State Dept. of Ecology, Olympia (USA)). Dec 1981. Contract FG06-80R001001. 145p. (WDOE—81-18). NTIS, PC A07/MF A01. Order Number DE82017777.

This inventory lists the name, type, crest length, hydraulic height, location, purpose, installed power capacity, and impoundment data for each of 851 dams in the state of Washington that meet the state criteria for size, i.e., dams that impound water to a depth of 10 ft or more or which retain at least 10 acre-ft. (LCL)

1303 Plant Design And Operation

59353 **(DOE/RA/23213—T1) DOE small-scale hydroelectric demonstration project: Riegel Textile Corporation, Fries, Virginia plant hydroproject. Final technical and construction cost report.** (Riegel Textile Corp., Ware Shoals, SC (USA)). Jun 1982. Contract FC07-79RA23213. 222p. NTIS, PC A10/MF A01. Order Number DE82020698.

Portions of document are illegible.

The Riegel Textile Corporation completed a 2163 kW generator project at its plant in Fries, Virginia. A new powerhouse was constructed to enclose a used 2900 hp vertical Kaplan turbine and Westinghouse generator. Construction was accomplished without modification to or rehabilitation of an existing dam and required only minor modification to or rehabilitation of an existing dam and required only minor modification to the existing appurtenances. The existing hydro-generation equipment supplies approximately 54% of the 5500 kW required by the Fries plant. With the addition of the new facility, the plant will generate approximately 74% of its total electrical requirements. This demonstrates the viability of utilizing hydro-generation in the operation of an industrial facility. The project annually generates a National Energy Savings of 19,387 barrels of oil equivalent. The project was separated into four phases which lasted a total of 36 months and included construction, erection and demonstration.

1305 Economics And Management

REFER ALSO TO CITATION(S) 59353

14 SOLAR ENERGY

59354 **Solar World Forum. Solar technology in the eighties.** Hall, D.O.; Morton, J. (eds.). Oxford, England; Pergamon Press Ltd (1982). 3374p. (CONF-810865—).

From Solar world forum; Brighton, UK (23 Aug 1981).

This is the conference proceedings in four volumes of the International Solar Energy Society Congress, Solar World Forum, held at Brighton, England during 23-28 August 1981. The theme of the congress, Solar Technology in the Eighties, encompasses all aspects of solar energy. The content of each volume is: Volume 1, Active heating and cooling in buildings. Volume 2, Agricultural processes; Biomass; Implementing solar energy; Industrial processes. Volume 3, Passive heating and cooling in buildings; Photochemistry, thermochemistry and advanced systems; Solar resources; Stimulating and modeling. Volume 4, Solar electricity generation; Solar energy in developing countries; Solar energy international and national programs.

1401 Resources And Availability

59355 **(SOLAR/0010—82/07) July 1982 environmental data for sites in the National Solar Data Network.** (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). Jul 1982. Contract AC01-79CS30027. 98p. NTIS, PC A05/MF A01. Order Number DE82021702.

Environmental data collected at the sites of the National Solar Data Network are tabulated for each solar site. The sites are grouped into 12 zones, each of which consists of several adjacent states. The insolation table presents the total, diffuse, direct, maximum, and extraterrestrial radiation for the solar site. It also shows the ratio of the total to extraterrestrial radiation as a percent. The temperature table gives the average, daytime, nighttime, maximum, minimum and inlet-water temperatures for the solar site. All of the passive and some of the active solar sites are equipped with wind sensors which provide information for two wind tables furnishing wind speed and direction. For some sites, a humidity table provides relative humidity values for day and night. It also gives values for the maximum and minimum humidity for each day. A technical discussion of the instruments and measurements used to obtain these tables is included. (LEW)

1403 Economics

59356 (DOE/ET/20279—216) Market and economic analysis of residential photovoltaic systems: final report. Tabors, R.D. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Jun 1982. Contract AC02-76ET20279. 42p. NTIS, PC A03/MF A01. Order Number DE82021955.

The market/economic implications of the effort in development and testing of residential photovoltaic power systems are evaluated. Summarized is work in the areas of market surveys, evaluation of previous work in user worth analysis in the residential sector, including retrofit applications, evaluation of presently available regional, econometric housing models which could be used to project housing stocks, and the analysis of retrofit potential for residential photovoltaic power systems given available roof area. The work reported represented, in general, the first steps in an anticipated ongoing research effort to monitor and evaluate the market potential for both new and retrofit residential photovoltaic systems in conjunction with the Lincoln Laboratory Solar Photovoltaic Residential Project. The overall structure of the project is described and its experience to date evaluating the US residential photovoltaic market or markets is summarized.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 59346, 59347, 59349, 59660, 59688, 60205, 60208, 60210

59357 (BMI—2097) Conversion of forest residues to a methane-rich gas in a high-throughput gasifier. Summary report. Feldmann, H.F.; Paisley, M.A.; Folsom, D.W.; Kim, B.C. (Battelle Columbus Labs., OH (USA)). 31 Oct 1981. Contract W-7405-ENG-92. 60p. NTIS, PC A04/MF A01. Order Number DE82020289.

Results of the experimental work conducted thus far have shown that wood can be readily gasified in a steam environment into a hydrocarbon rich fuel gas that can be used as a replacement for petroleum-based fuels or natural gas with minimal boiler retrofit. Further, this conversion can be achieved in a compact gasification reactor with heat supplied by a circulating entrained phase, thereby eliminating the need for an oxygen plant. Tars have not been found except at the lowest gasifier temperatures employed, and therefore heat recovery from the product gas should be much simpler than that from commercially available fixed-bed gasification systems where product gas contains significant quantities of tar. The data generated have been used in a preliminary conceptual design. Evaluation of this design has shown that a medium-Btu gas can be produced from wood at a cost competitive with natural gas or petroleum-based fuels.

59358 (DOE/EIA—0341) Estimates of US wood energy consumption from 1949 to 1981. (Department of Energy, Washington, DC (USA). Energy Information Administration). Aug 1982. 153p. NTIS, PC A08/MF A01. Order Number DE82020578.

The methodologies used to estimate historical levels of wood consumption in the residential, commercial, industrial, and utility sectors nationally from 1949 to 1981, by State for 1960 to 1983, and nationally by month for 1973 to 1981 are described. The wood consumption estimates are presented.

59359 (DOE/ET/20068—T1-Vol.1) Crop, forestry, and manure residue inventory: continental United States. Volume 1. New England and Mid-Atlantic including: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, and Pennsylvania. (Stanford Research Inst., Menlo Park, CA (USA)). Jun 1976. Contract AT03-76ET20068. 120p. NTIS, PC A06/MF A01. Order Number DE82021985.

This document is one of eight similar data packages that make up a national residue inventory summarizing annual agricultural wastes generated in the nine census regions within the continental United States. The inventory is based upon data available through mid-1975 which are shown in Section II by region, state, and country, as well as by waste type, amount, and use.

59360 (DOE/ET/20068—T1-Vol.4) Crop, forestry, and manure residue inventory: continental United States. Volume 4. South Atlantic including: Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia. (Stanford Research Inst., Menlo Park, CA (USA)). Jun 1976. Contract AT03-76ET20068. 280p. NTIS, PC A13/MF A01. Order Number DE82021986.

This document is one of eight similar data packages that make up a national residue inventory summarizing annual agricultural wastes generated in the nine census regions within the continental United States. The inventory is based upon data available through mid-1975 which are shown in Section II by region, state, and country, as well as by waste type, amount, and use.

59361 (DOE/JPL/955843—82/6) Large-area sheet task: advanced dendritic-web growth development. Quarterly report, January 1, 1982-March 31, 1982. Duncan, C.S.; Seidensticker, R.G.; McHugh, J.P.; Hopins, R.H.; Meier, D.; Schruben, J. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). 18 Aug 1982. Contract NAS-7-100-955843. 30p. NTIS, PC A03/MF A01. Order Number DE82021554.

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The new discrete shield temperature model was completed and verified. Modifications to the low-stress configuration were tested experimentally to evaluate effects on growth speed. A composite lid and shield configuration combining the low-stress features with the width-limiting characteristics was fabricated and tested. Several long crystals were grown with width limited to about 3.3 cm and with melt replenishment, although the configuration is not yet optimized for steady-state growth.

59362 (DOE/JPL/955986—3) Development of technique for AR coating and nickel and copper metallization of solar cells. FPS project product development. Quarterly technical report No. 4, April 1, 1982-June 30, 1982. Taylor, W. (Photowatt International, Inc., Tempe, AZ (USA)). 15 Jul 1982. Contract NAS-7-100-955986. 19p. NTIS, PC A02/MF A01. Order Number DE82021382.

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Experimental matrices were conducted to determine a suitable firing schedule for fritless tin printing ink. Considerable difficulties were encountered with oxidation. Best results were obtained with a firing cycle consisting of 400°C for 20 minutes in nitrogen followed by 5 minutes in air at 500°C. Elimination of oxidizing conditions impaired the adhesion of both tin and copper fritless printing inks, although adhesion of fritless copper inks was obtained when fired in nitrogen with slight oxidation.

59363 (EPRI-AP—2567) Technical evaluation of wood gasification. Final report. Oliver, E.D. (Synthetic Fuels Associates, Inc., Palo Alto, CA (USA)). Aug 1982. 66p. NTIS, PC A04/MF A01. Order Number DE82905493.

Biomass gasification was to be assessed in terms of operability and technical performance by investigating installed commercial gasifiers. Only one gasifier installation, the Omnifuel gasifier at Hearst, Ontario met the criteria selected to identify commercial installations able to provide operating data for engineering analysis. Although the data contained gaps and inconsistencies, a reasonably consistent picture of gasifier operation was derived. The gasifier was observed to be responsive to controls, but no long-term operating and maintenance data were available.

59364 (LBL—14639) Electrochemical storage cell based on polycrystalline silicon. Final report, 1 March 1981-1 March 1982. Canfield, D.; Morrison, S.R. (Lawrence Berkeley Lab., CA (USA)). 28 Feb 1982. Contract AC03-76SF00098. 56p. NTIS, PC A04/MF A01. Order Number DE82020595.

Theoretical and experimental investigations on the performance of n and p-type silicon in solution for efficient solar energy conversion were conducted. Part of the work sought to identify redox couples capable of inducing maximum band bending (highest open circuit voltage) and limit the corrosion for both n and p-type silicon. High photovoltages were obtained by using vanadium (II/

III) and ferrocene/ferricenium couples for p-type and n-type silicon respectively. These couples demonstrated reasonable stability, but their efficiency was limited by the growth of a relatively thick insulating SiO_2 corrosion layer. Corrosion studies were performed to evaluate the use of HF to remove the corrosion layer and to consider the interaction between HF and the redox couple. Much of the experimental and theoretical work focused on the effect of the surface oxide on solar cell characteristics and led to a variety of surface treatments aimed at improving the fill factor of silicon photoelectrochemical cells. The surface treatments included high temperature annealing of the normal oxide under an argon or hydrogen atmosphere, coating a p-n junction with a thin layer of platinum, and passivation with poly-vinylcarbazole polymer. (LEW)

59365 **(SERI/PR—234-1470) Fundamental air-gasification engineering parameters. Annual report for fiscal year 1981.** Desrosiers, R. (Solar Energy Research Inst., Golden, CO (USA)). Feb 1982. Contract AC02-77CH00178. 24p. NTIS, PC A02/MF A01. Order Number DE82021612.

A mathematical simulation of an air-blown, updraft gasifier was used to study the effect of char reactivity, particle size, and steam rate on the temperture and composition profiles in the bed of reactor. The results are insensitive to the rate assumed for the reaction of char with oxygen since this reaction appears to be diffusion limited. For a dry air blast, the maximum temperature achieved is determined chiefly by the rate of the char-CO_2 reaction, which is a feed-dependent parameter. The rate of char combustion reaction is inversely proportional to D/sub p/$^{1.6}$, where D/sub p/ is the particle diameter, while the char-CO_2 and char-steam reactions are inversely proportional to D/sub p/. Since the maximum temperature is strongly dependent on any parameter which affects the balance of these two sets of reactions, the particle size is a very sensitive variable. The minimum overall bed length required for complete char conversion is found to vary quadratically with D/sub p/. In the range of 1000°C, the temperature does not vary monotonically with steam rate as expected.

59366 **(SERI/TP—234-1654) Ablative fast pyrolysis of biomass in the entrained-flow cyclonic reactor at SERI.** Diebold, J.; Scahill, J. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1982. Contract AC02-77CH00178. 40p. (CONF-820685—2). NTIS, PC A03/MF A01. Order Number DE82019768.

From 14. biomass thermochemical conversion contractor's meeting; Arlington, VA, USA (23 Jun 1982).

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Progress with the entrained flow cyclonic reactor at SERI is detailed. Feedstocks successfully used include wood flour and fairly large sawdust. Preliminary results show that relatively complete vaporization of the biomass is realized and that the yields of tar or gas can be varied over quite a range with trends following first order kinetic concepts.

59367 **(SERI/TP—611-848) Melt growth of silicon sheets by edge-supported pulling.** Ciszek, T.F.; Hurd, J.L. (Solar Energy Research Inst., Golden, CO (USA)). Nov 1980. Contract AC02-77CH00178. 10p. (CONF-800544—4). NTIS, PC A02/MF A01. Order Number DE82021747.

From Electrochemical Society meeting: St Louis, MO, USA (11 May 1980).

Silicon sheets over 14 cm^2 in area and less than 0.4 mm in thickness have been solidified from the melt by an edge-supported pulling technique. A capillary film of liquid silicon is formed between two parallel wettable filaments immersed in the liquid. As the filaments are pulled away from the melt, the remote region of the film solidifies between the filaments in a continuous fashion while the meniscus is replenished by capillarity. Grain sizes of 0.2 cm^2 for unseeded growth and 2 cm^2 for seeded growth were obtained. An average AMI solar cell efficiency of 10% was attained on unseeded sheets, while the average was 13% for sheets grown from seeds with a (anti 110)) face and a [anti 1 anti 12] axis.

59368 **(PB—82-192808) Evaluation of thin Pd, Pt and Ni silicides Schottky barriers for silicon solar cells. Large area uniform growth of Si layer by solid phase epitaxy (II). Final report.** Canali, C. (Commission of the European Communities, Luxembourg). [nd]. 28p. (EUR—7096-EN). NTIS PCE03/MF E03.

The phase stability of silicides of Ni, Pt and Pd in contact with single crystal or amorphous silicon is examined. The presence of a particular silicide phase is identified by X-ray diffraction, and Rutherford backscattering is used to study composition. It is concluded that Pt or Pd silicides are suitable for Schottky barriers. Layers of silicon can be grown quickly by solid phase epitaxy at temperatures of 300-500C and using an intermediate metal film. Experimental results are reported. Doped layers have been obtained which have electrical characteristics suitable for the junctions in solar cells. The effects of impurities and orientation of the substrate on the growth kinetics are discussed.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 59356

59369 **(DOE/ET/20279—207) Electrical aspects of photovoltaic-system simulation.** Hart, G.W.; Raghuraman, P. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). Jun 1982. Contract AC02-76ET20279. 22p. NTIS, PC A02/MF A01. Order Number DE82021956.

Portions of document are illegible.

A TRNSYS simulation has been developed to simulate the performance of utility-interactive residential photovoltaic energy systems. The PV system is divided into its major functional components, which are individually described with computer models. These models are described in detail. The results of simulation and actual measured data obtained at MIT Lincoln Laboratory's Northeast Residential Experiment Station are compared. The electrical influences on the design of such photovoltaic energy systems are given particular attention.

59370 **(DOE/ET/20279—214) Data report for the Northeast Residential Experiment Station, April 1982.** Russell, M.C.; Raghuraman, P.; Mahoney, P.C. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). Jun 1982. Contract AC02-76ET20279. 20p. NTIS, PC A02/MF A01. Order Number DE82021954.

Portions of document are illegible.

Physical performance data obtained from photovoltaic energy systems under test at the Northeast Residential Experiment Station (NE RES) in Concord, Massachusetts, are tabulated for the month of April 1982. Five prototype residential photovoltaic systems are under test at the NE RES, each consisting of a roof-mounted array sized to meet at least 50% of the annual electrical demand of an energy-conserving house, and an enclosed structure to house the remainder of the photovoltaic system equipment, test instrumentation, and work space. Each system is grid-connected. In addition, one full-sized PV residence - the Carlisle House - is also being monitored in Carlisle, Massachusetts. The features of the systems and of the houses are briefly summarized, and the monthly performance of the monitored houses, PV systems, and meteorological data is tabulated. Also tabulated is hourly information for an average day of the month including data on the monitored houses and prototype systems data. Data include energy consumption, array and inverter outputs, energy supplied to and by the utility, solar array panel temperatures, and total tilt insolation. Also included are tables that present the hypothetical energy exchange between the system and the utility if each prototype system supplied energy to each monitored house. These data are also graphed, as well as the duration of time for which the load had a specific value. (LEW)

59371 **(SERI/TR—214-1567-Vol.1) Performance criteria for photovoltaic energy systems. Volume I.** Nuss, G.; DeBlasio, R.; Forman, S.; Hoffman, A.; Hogan, S.; Longrigg, P.; Post, H.; Ross, R.; Schafft, H. (Solar Energy Research Inst., Golden, CO (USA)). Jul 1982. Contract AC02-77CH00178. 179p. NTIS, PC A09/MF A01. Order Number DE82021958.

The state of the art is presented in defining performance criteria for photovoltaic (PV) systems and their components-the PV array, power conditioning, monitor and control, and storage subsystems, cabling, and power distribution. Each performance criterion consists of a criterion statement, an evaluation statement that describes how compliance with the criterion statement can be evaluated, and a commentary statement to provide necessary supportive or background information. Performance criteria deal with: electrical, thermal, mechanical/structural, safety, durability/reliability, installation, operation and maintenance, and building and site characteristics. The performance criteria are not prescriptive; they are performance-oriented to allow for innovation and for a variety of approaches to obtain desired objectives for a PV system or subsystem. A glossary is presented with definitions relevant to photovoltaic subsystems. A subject index to the performance criteria is also included. (LEW)

59372 **(SERI/TR—214-1567-Vol.2) Performance criteria for photovoltaic energy systems. Volume II.** Nuss, G.; DeBlasio, R.; Forman, S.; Hoffman, A.; Hogan, S.; Longrigg, P.; Post, H.; Ross, R.; Schafft, H. (Solar Energy Research Inst., Golden, CO (USA)). Jul 1982. Contract AC02-77CH00178. 242p. NTIS, PC A11/MF A01. Order Number DE82021683.

A unified body of 30 test procedures for the evaluation of photovoltaic subsystem performance criteria is established. The test methods represent recommended evaluation procedures, but they are not consensus standards tests. The tests address electrical, thermal, mechanical, and durability aspects of the solar cell array, and the electrical aspects of the power conditioning subsystem and battery storage subsystem. (LEW)

59373 **Thermal energy utilization in the Mississippi County Community College Photovoltaic Project.** Deaver, F.K. (Arkansas, University, Fayetteville, Ark.); Turner, W.D. (Cromwell, Neyland, Truemper, Levy, and Gatchell, Inc., Little Rock, Ark.). *American Society of Mechanical Engineers, [Paper]*; No. 79-WA/SOL-29, vp(1979). (CONF-791205—).

From ASME winter annual meeting; New York, NY, USA (2 Dec 1979).

The first DOE funded solar photovoltaic demonstration project at the Mississippi County Community College in Blytheville, Arkansas is examined. One of the features of the project, the cooling loop for the silicon cells and the subsequent utilization of the thermal energy to supply heat to the building are described in detail. The overall configuration of the Solar Photovoltaic Conversion System includes four major functional subsystems: the collection subsystem, the power conditioning system, the solar energy control subsystem, and the collector cooling/thermal subsystem.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 59407, 59412

59374 **(DOE/NBM--2019085) Solar cogeneration.** (Sandia National Labs., Livermore, CA (USA)). Apr 1982. Contract AC04-76DP00789. 20p. NTIS, PC A02/MF A01. Order Number DE82019085.

Portions of document are illegible.

After a brief introduction to the operational principles and advantages of solar cogeneration, seven cogeneration studies are summarized covering such applications as sulfur mining, copper smelting, enhanced oil recovery, natural gas processing, sugar mill operations, and space heating and cooling. For each plant is given a brief site description, project summary, conceptual design, and functional description, including a picture of the facility and a flow chart. Also listed are the addresses of the companies involved for obtaining additional information. (LEW)

59375 **Solar thermal central receiver systems.** Siebers, D.L.; Abrams, M.; Gallagher, R.J. (Sandia Laboratories, Livermore, Calif.). *American Society of Mechanical Engineers, [Paper]*; No. 79-WA/HT-38, vp(1979). (CONF-791205—).

From ASME winter annual meeting; New York, NY, USA (2 Dec 1979).

Research needs in the thermal sciences relevant to the development of the solar central receiver concept are identified. The primary need is the creation of theoretical and empirical tools to predict energy loss from cavity and external receivers due to combined natural and forced convection heat transfer. The possibility of using boundary layer suction to reduce the convective energy loss is explored. The technique is found to be advantageous if the energy in the withdrawn air is recovered. In an unrelated problem area, a test to quantify boiling-induced thermal fatigue in a solar receiver is described.

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

59376 **(DOE/NOAA/OTEC—2) Assessment of the state-of-the-art technology related to SKEET (Station Keeping Subsystem Engineering Evaluation Tool). Final report.** (Hoffman Maritime Consultants, Inc., Glen Head, NY (USA)). Aug 1979. Contract AI01-77ET20396. 156p. NTIS, PC A08/MF A01. Order Number DE82021821.

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The fundamental purpose for Station Keeping Subsystem Engineering Evaluation Tool (SKEET) is to provide a means of simulating and evaluating OTEC platform station keeping subsystem (SKSS) performance. This evaluation capability may be employed in the process of design review, comparison of alternative concepts, operational planning, establishing risk and reliability criteria, and other applications. The principal elements which should be represented by the SKEET model include: environment (wind, current, waves), vessel/cold water pipe configuration, mooring system, and dynamic positioning system effects. As a fundamental step in defining the requirements for a SKEET, an assessment of the state of the art of relevant areas of technology has been conducted. The assessment entails a literature survey, synopsis of pertinent references and computer programs, and a compilation of findings relevant to each of the basic elements of the SKEET. It is found that most of the major elements required to implement SKEET exist. (LEW)

59377 **(DOE/NOAA/OTEC—15) OTEC modular experiment: cold-water pipe-system design study.** (Science Applications, Inc., La Jolla, CA (USA)). Dec 1979. Contract AI01-77ET20396. 300p. (SAI—057-79-1049LJ). NTIS, PC A13/MF A01. Order Number DE82021823.

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The Cold Water Pipe (CWP) System Design study was undertaken to evaluate the diverse CWP concepts, recommend the most viable alternatives for a 1984 deployment of the 10-40 MWe Modular Experiment Plant, and to develop baseline designs. Specific objectives were to develop CWP concepts for stationary and grazing mode OTEC plants along with fabrication/construction/installation plans and cost estimates. CWP designs were to be integrated with the relevant subsystems, have a 30-year design life, meet the imposed performance criteria, and be cost effective. Baseline designs were developed for three concepts - stiffened steel shell, fiberglass sandwich, and bottom mounted stiffened steel shell. Subsystem design is discussed, including flexible joints, inlets, plenum arrangements, cathodic protection system, and vortex strumming suppression. Also discussed are program requirements, CWP commercial viability, technology transfer, and environmental impact. (LEW)

59378 **(DOE/NOAA/OTEC—18) Fiber-reinforced-plastic cold-water-pipe test plan. Final report.** Renoud, W.J.; DeVilbiss, J.L. (Fiberglass Structural Engineering, Bellingham, WA (USA)). 24 Oct 1978. Contract AI01-77ET20396. 70p. NTIS, PC A04/MF A01. Order Number DE82021822.

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The tests have been designed to evaluate joint performance and to obtain the engineering properties of Fiber Reinforced Plastics (FRP) that are germane to the development of an OTEC FRP Cold Water Pipe. Both material property tests and tests of cold water pipe joint configurations using FRP are planned. Engineering properties of interest include: ultimate tensile strength, tensile modulus of elasticity, flexural strength, flexural modulus of elasticity, fatigue strength at an expected 30-year service life, and Poisson's Ratio. The tests selected have been chosen and designed to satisfy the following requirements: establish initial fatigue test stress levels through fracture testing of the various candidate joint and laminate configurations, evaluate the fatigue resistance of Fiber Reinforced Plastic joints and laminates subjected to a non-stationary random loading, evaluate the long-term degradation of material properties in a marine environment, design of a cold water pipe, and obtain a baseline of acoustical emission data for in-service nondestructive monitoring of FRP Cold Water Pipe performance. As an aid to planning and budgetary control, the test costs and schedules are presented in terms of four options, each option including a wider scope of testing effort than its predecessor. Option One, the most basic of the four options, covers axial fracture and fatigue tests of three joint configurations. Option Two adds to the tests of Option One flexural fracture and fatigue testing of the same three joints. Option Three introduces fracture and fatigue tests of two FRP laminate configurations, and Option Four, the flexure testing of those same laminates. The final long-term fatigue test of each test option will be made on the best surviving joint or laminate configuration of that test series.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 59374, 59411

59379 **(DOE/CS/30364—T1) Preliminary design report for passive-solar manufactured building.** (Burns/Peters Group, Albuquerque, NM (USA)). 1 Jul 1980. Contract FC02-80CS30364. 60p. NTIS, PC A04/MF A01. Order Number DE82015223.

Portions of document are illegible.

Three design concepts were developed for a passive solar manufactured building, 28' x 60', designed to be transportable throughout New Mexico without being dismantled. All of the designs use the south-facing wall for solar collection, solar domestic water heating systems, evaporative coolers, natural ventilation, and daylighting. Two of the schemes use water drum thermal storage and the other uses direct gain. (MHR)

59380 **(DOE/CS/32128—T1) Operation and maintenance of the SOL-DANCE building solar system. Final report.** (Wolfe Co., Inc., Albuquerque, NM (USA)). 29 Jul 1980. Contract FC03-78CS32128. 126p. NTIS, PC A07/MF A01. Order Number DE82021993.

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The Sol-Dance building solar heating system consists of 136 flat plate solar collectors divided evenly into two separate building systems, each providing its total output to a common thermal storage tank. An aromatic base transformer oil is circulated through a closed loop consisting of the collectors and a heat exchanger. Water from the thermal storage tank is passed through the same heat exchanger where heat from the oil is given up to the thermal storage. Back-up heat is provided by air source heat pumps. Heat is transferred from the thermal storage to the living space by liquid-to-air coils in the distribution ducts. Separate domestic hot water systems are provided for each building. The system consists of 2 flat plate collectors with a single 66 gallon storage tank with oil circulated in a closed loop through an external tube and shell heat exchanger. Some problems encountered and lessons learned during the project construction are listed as well as beneficial aspects and a project description. As-built drawings are provided as well as system photographs. An acceptance test plan is provided that checks the collection, thermal storage, and space and water heating subsystems and the total system installation. Predicted performance data are tabulated. Details are discussed regarding operation, maintenance, and repair, and manufacturers data are provided. (LEW)

59381 **(LA—9421-MS) Passive-solar test modules.** Moore, E.F.; McFarland, R.D. (Los Alamos National Lab., NM (USA)). Jun 1982. Contract W-7405-ENG-36. 80p. NTIS, PC A05/MF A01. Order Number DE82021841.

Presented are the results of a survey of the use of test boxes, rooms, and buildings for passive solar research in the United States and Canada. In addition to presenting a survey, this report provides an introductory guide to experimental methods in passive solar heating for researchers who have limited familiarity with test-module design, heat transfer, computer simulation, and data acquisition. The experimental uses and physical characteristics of test modules are discussed and existing facilities are described. Basic principles of thermal network computer modeling of passive systems, test-room thermal load measurement, and data-acquisition systems are described in appendices.

59382 **(LA-UR—82-2496) Los Alamos National Laboratory solar program.** Reisfeld, S.K.; Neeper, D.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 13p. (CONF-820940—2). NTIS, PC A02/MF A01. Order Number DE82021760.

From Passive and hybrid solar energy update conference; Washington, DC, USA (15 Sep 1982).

Portions of document are illegible.

Progress is reported for passive solar tasks performed at the Los Alamos National Laboratory during FY 1982. Results on test cell experiments for the 1981-1982 winter are reported, as are Class A performance monitoring, passive cooling, both residential and commercial economic cooling assessments, and thermal effects of distributed mass in passive buildings.

59383 (NP—2901836, pp 20-28) **Braemhult project at Boraas. 9 family villas with total of 150 m² solar collectors and common heat pump system in form of ice machine utilizing the melt heat.** Lagerkvist, K. (Statens Provningsanstalt, Boraas, Sweden). 1981. (In Swedish). NTIS (US Sales Only), PC A04/MF A01.

From Solar energy day; Denmark (7 May 1981).

The combined heat-system uses sun and air as primary heat sources and water as storage medium. The district heating central supplies heat to domestic floor heating either directly through heat-exchangers or by use of a heat-pump. Ice-melting heat is stored in the water tank in periods with poor insolation. Such systems for water heating in Swedish scale might save about 10TWh/year in oil energy. At present investments for Braemhult combined system are 5 SwKr/kWh, while yearly cost is 0.75 SwKr/kWh.

59384 (NP—2901836, pp 29-38) **Ministry of Energy's demonstration project in Naestved. Combined system with 90 m² solar collectors, 8-module heat-pump and 1000 m ground coils.** Ellehauge, K. (Danmarks Tekniske Hoejskole, Lyngby. Lab. for Varmeisolering). 1981. (In Danish). NTIS (US Sales Only), PC A04/MF A01.

From Solar energy day; Denmark (7 May 1981).

A combined solar-heat pump system at Naestved (Eastern Denmark) together with four gas furnaces constitutes a district heating plant for two larger buildings - 14 apartments. The solar collector is of 85 m² area, 3 heat pumps have 14.3 kW pump, about 1000 m ground coils and emergency gas heaters 4 x 10 kW are complimenting the system. The whole demonstration project is expected to be ended in 1982 and has still some unsolved problems.

59385 (NP—2901836, pp 39-48) **Calculation methods for combined solar heat - heat pump system.** Soenderskov Joergensen, L. (Danmarks Tekniske Hoejskole, Lyngby. Lab. for Varmeisolering). 1981. (In Danish). NTIS (US Sales Only), PC A04/MF A01.

From Solar energy day; Denmark (7 May 1981).

Computerized calculation methods prove superiority of the combined systems with water as storage medium as compared to a solar heating system without heat pump. Ground source heat pumps do not give special energetic gain. Combined systems are more complex than the traditional ones and operation gives yet some problems.

59386 (NP—2901836, pp 49-64) **SUN SEC project at Fjaeraas. Measurement results from a low energy house with combined solar heating-heat pump system.** Kristensen, P.E. (EK Energiraadgivning I/S, Gentofte, Denmark). 1981. (In Danish). Dep. NTIS (US Sales Only).

From Solar energy day; Denmark (7 May 1981).

SUN SEC is an experimental house with combined 32 m^2 solar collector and 3 m^3 water accumulator. Heat pump transfers heat from accumulator to the floor heating system. The heating needs in the period Apr. 1980 - March 1981 were 8800 kWh. The heating system covered 56%, the remaining 44% is electricity for heating, ventilation and automation. Automatic control is still problematic, as the floor heating system ran no more than 30-35degC most of the time.

59387 (SAND—81-2390C) **Results of solar testing of circular foil heat-flux sensors at the White Sands Solar Furnace.** Bainbridge, B.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 27p. (CONF-821001—1). NTIS, PC A03/MF A01. Order Number DE82006282.

From STTFUA high-intensity solar flux measuring techniques workshop; Albuquerque, NM, USA (26 Oct 1982).

A pair of circular foil heat flux sensors were tested against a Kendall radiometer at the White Sands Solar Furnace facility in September, 1981. The gages are a novel form of the circular foil type in that a mirrored ellipsoidal cavity is positioned in front of the foil surface. A small diameter aperture is used to reduce convective losses and the susceptibility of the gage to handling damage. An error analysis performed on the data acquired during the 5 day test program, indicates that atmospheric conditions and limitations of the facility preclude the accurate comparison of the heat flux sensors to the Kendall radiometer. Details about the data acquisition, error analysis, and considerations about the proper gage calibration procedure are included.

59388 (SERI/TP—254-1675) **Performance monitoring of passive solar residences at the Class B level.** Swisher, J.N.; Harr, K.S.; Frey, D.J.; Holtz, M.J. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1982. Contract AC02-77CH00178. 24p. (CONF-820849—4). NTIS, PC A02/MF A01. Order Number DE82021603.

From Summer study in energy efficient buildings; Santa Cruz, CA, USA (22 Aug 1982).

Portions of document are illegible.

The Residential Class B Passive Solar Performance Monitoring Program is a low-cost program that evaluates the thermal performance of numerous residential buildings throughout the country. The Class B instrumentation package is designed to calculate a basic energy balance on a building, separating the building energy load into passive solar heating, auxiliary heating, and internal heating. A microprocessor-based data acquisition system receives data on up to 22 channels every 15 seconds and stores channel averages hourly on cassette tape. The system calculates daily and monthly performance factors, including the building's major energy flows, in real time and then prints and stores them on a daily basis.

59389 (SERI/TR—253-1429) **Dynamic performance of packed-bed dehumidifiers: experimental results from the SERI desiccant test loop.** Kutscher, C.F.; Barlow, R.S. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1982. Contract AC02-77CH00178. 47p. NTIS, PC A03/MF A01. Order Number DE82021968.

Discussed are the design and construction of a desiccant test loop and results of tests with a silica-gel-packed bed. The test loop consists of two centrifugal fans, two duct heaters, a steam humidifier, 24.4m (80 ft) of 30-cm (12-in.) circular duct, instrumentation, and a test section. The loop is capable of testing adsorption and desorption modes at flow rates up to 0.340 kg/s (600 scfm) and at regeneration temperatures up to 120°C (248°F). Tests of a 74-cm(29-in.)-diameter, 3.2-cm(1.25-in.)-thick silica gel bed indicated that mass transfer occurs more readily in the adsorption direction than in the desorption direction. Pressure drop data indicated that the resistance of each of the two screens that hold the silica gel in place was equivalent to 2.5-cm(1-in.) of silica gel due to plugging. Results of the tests were also used to validate a SERI desiccant computer model, DESSIM.

59390 (SOLAR/1027—82/14) **Environmental Partnership, Cream Ridge, New Jersey solar-energy-system performance evaluation, October 1981-March 1982.** Kendall, P.W. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 85p. NTIS, PC A05/MF A01. Order Number DE82021303.

The Environmental Partnership site (also known as the Bonillia Home) is a two-story, single family home on a wooded lot in New Jersey. The wood platform-framed house uses three major passive solar energy systems - a 168-square-foot sunspace, a 344-square-foot Trombe wall, and a breadbox type passive solar hot water heater. The system was designed to provide 75% of the total load at the site, but only achieved 30%. Storage is in a 50,000-pound concrete wall 12 inches thick and in 32 3-foot phase-change rods. Auxiliary systems include a dual-fuel wood/propane furnace, wood stove, 50-gallon auxiliary water heater with propane fuel, and a cooling fan. Monthly performance data are tabulated for the overall solar heating system and for the individual components - Trombe wall, sunspace, storage, water heater, and space heating subsystem. Monthly data are also tabulated for weather, energy savings, and the passive solar system environment. Typical system operation is illustrated by graphs of temperatures at various places in the system vs time for a typical day. The system operating sequence is also illustrated by a bar chart of the operation of the wood/propane furnace and the fan. (LEW)

59391 (SOLAR/1047—82/24) **First Manufactured Homes Lot 9 and Lot 10, Lubbock, Texas: solar-energy-system performance evaluation, September 1981 through February 1982.** Raymond, M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 128p. (SOLAR/1105—82/24). NTIS, PC A07/MF A01. Order Number DE82021699.

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The First Manufactured Homes sites are nearly identical single family residences on adjacent lots in Lubbock, Texas. The active solar energy systems are designed to supply 69% of the heating and 86% of the hot water load. Each system is equipped with 288 square feet of air collectors and a 216-cubic-foot site-built rock bin for storage. Auxiliary water heating is provided in each case by a 4.5 kW electric resistance element in the 42-gallon hot water tank. The first home, Lot 9, has an air-to-air heat pump with electric resistance heater for auxiliary space heating while the second, Lot 10, has a 10 kW fan coil electric duct heater. The houses' thermal performances were very different, with the Lot 9 house almost achieving design goals and the Lot 10 house substantially below. Monthly performance data are tabulated for the overall system, and for the collector, storage, and hot water subsystems. Typical system operation is illustrated by graphs of temperatures at different places in the systems and collector fluid flow vs. time for a typical day. The typical system operating sequence and solar energy utilization and heat losses are also graphed. (LEW)

59392 (SOLAR/1060—82/24) **Cathedral Square, Burlington, Vermont: solar-energy-system performance evaluation, January 1982 through April 1982.** Welch, K.M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 84p. NTIS, PC A05/MF A01. Order Number DE82021696.

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The Cathedral Square solar site is a 10-story multi-unit apartment building in Vermont whose active solar energy system is designed to supply 51% of the hot water load. The system consists of 1798 square feet of flat plate collectors, a 2699 gallon water tank, and two auxiliary natural gas boilers that supply hot water to immersed heat exchanger in the auxiliary storage tank. The portion of the hot water load supplied was only 26%. The discrepancy is due to the fact that hot water consumption was less than expected. Performance data are tabulated for the system overall, the collector subsystem, and the domestic hot water subsystem for each month. Typical operation is illustrated by graphs of the temperatures at various parts of the system vs. time for a typical 24-hour period. The system operating sequence and solar energy utilization and losses are also graphed. (LEW)

59393 **(SOLAR/1101—82/14) South Bridge Tower, New York, New York: solar-energy-system performance evaluation, January 1981 through February 1982.** Howard, B.D. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 82p. NTIS, PC A05/MF A01. Order Number DE82021700.

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The South Bridge Tower site is a cooperative housing complex in New York City whose active solar energy system is designed to supply 24% of the hot water load. The system consists of 3742 square feet of flat plate collectors and a 3750-gallon, site-built, roof-mounted tank. Auxiliary heating is purchased low pressure steam. The measured solar fraction was only 7% due to larger-than-expected hot water demand. Monthly performance data are tabulated for the overall system, storage subsystem, collector subsystem, and domestic hot water subsystem. Also tabulated are the monthly operating energies. Typical system operation is illustrated by graphs of temperatures at different parts of the tank, collector flow, water consumption, etc. vs. time for a typical day. Also a typical system operating sequence and the solar energy utilization and heat losses are graphed. (LEW)

59394 **(SOLAR/1103—82/14) Arno Kahn, Duluth, Minnesota: solar-energy-system performance evaluation, September 1980-April 1982.** Raymond, M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 106p. NTIS, PC A06/MF A01. Order Number DE82021298.

The Arno Kahn site is a single family residence in Minnesota with a solar energy system designed to provide 60% of the space heating load. The house has a double envelope integrated with a sunspace and separated from the inner envelope by a three-story mass wall. The house also has a passive breadbox type water heater. The solar fraction is given for both the space heating and water heating, and conventional fuel savings are given. Monthly performance data are tabulated for the overall system and for the collector, storage, space heating, and water heating subsystems. Building performance is also illustrated by a graph for each month of the daily insolation, ambient air, building, and storage temperatures, and auxiliary heat. Also graphed are the storage charging and discharging cycles, and profiles of daily average hot water and solar energy consumption. (LEW)

59395 **(SOLAR/1109—82/14) Lo-Cal, Champaign, Illinois solar-energy-system performance evaluation, January 1982-April 1982.** Spears, J.W. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 73p. NTIS, PC A04/MF A01. Order Number DE82021299.

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The Lo-Cal site is a single family residence in Illinois with a direct gain solar heating system equipped with 200 square feet of south-facing triple-glazed windows and an auxiliary 84,000 Btu/hour forced-air furnace. For the months of January through April 1982, the solar fraction was found to be 29%, corresponding to a saving of 3107 kWh of conventional fuel. Monthly performance data are tabulated for the overall sytem, and for the collector and space heating subsystems. Also tabulated are monthly energy savings, weather, and passive system environment data. The building's performance is illustrated by graphs for each month of the daily insolation, auxiliary heat, building temperature, and ambient temperature. (LEW)

59396 **(SOLAR/1115—82/14) Williamson Home, Ipswich, Massachusetts solar-energy-system performance evaluation, November 1981-April 1982.** Cramer, M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 82p. NTIS, PC A05/MF A01. Order Number DE82021300.

The Williamson Home in Massachusetts is a single family residence whose active-solar-energy system is designed to supply 47% of the space heating and 91% of the hot water. The system is equipped with 339 square feet of flat plate collectors, a 240-cubic-foot rock bin for storage, a propane-gas furnace and a 100-gallon propane gas hot water tank for auxiliary heating. Monthly performance data are tabulated for the overall system and for the collector, hot water, and space heating subsystems. Also tabulated are solar coefficients of performance, solar operating energy, energy savings, and weather conditions. Also given is a graph of collector array efficiency vs the difference between the inlet water and ambient temperatures divided by insolation. System operation is illustrated by graphs of typical insolation data and outside ambient and indoor temperatures, collector operating periods and inlet/outlet temperatures, and typical storage and distribution temperatures vs time for a typical day. The system operating sequence and solar energy utilization and losses are also graphed. (LEW)

59397 **(SOLAR/1116—82/14) Isakson Home, Anoka, Minnesota solar-energy-system performance evaluation, August 1981-March 1982.** Cramer, M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 77p. NTIS, PC A05/MF A01. Order Number DE82021297.

The Isakson Home in Minnesota is a single family residence whose active-solar-energy system is designed to supply 76% of the heating and hot water load. The system consists of 183 square feet of flat plate collectors, a 350-gallon water storage tank, and for back-up, an oil-fired furnace and 52-gallon electric water heater. Monthly performance data are given for the overall system and for the collector, domestic hot water, and space heating subsystem. Monthly data are also tabulated for the coefficient of performance, solar operating energy, energy savings, and weather. Typical system operation is illustrated by graphs of temperatures at various parts of the system vs time for a typical day, and by graphs of fuel use and hot water use vs time. The system operating sequence is also graphed and solar energy utilization and losses are given. (LEW)

59398 **(SOLAR/1117—82/14) Kalin Home, Long Island, New York: solar-energy-system performance evaluation, September 1981-March 1982.** Howard, B.D. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 78p. NTIS, PC A05/MF A01. Order Number DE82021701.

The Kalin Home is a single family residence in East Meadow, Long Island, New York whose active solar energy system is designed to supply 60% of the hot water load. The system is equipped with 2 flat plate collectors with a combined area of 48 square feet and a 120-gallon tank for storage. Auxiliary heating is provided by a 4.5 kW single-element electric heater interfaced to off-peak power metering equipment to deliver auxiliary energy from midnight through 7:00 AM. Performance data for the total reporting period are summarized. In addition, monthly performance data are tabulated for the overall system and for the collector and domestic hot water subsystems. Predicted performance and performance measured during previous systems are also given for comparison. System operation for a typical day is illustrated by graphs of temperatures at various points in the system vs. time and by hourly water consumption graphs. A typical system operating sequence and solar energy utilization and heat losses are also graphed. (LEW)

59399 **(SOLAR/1118—82/14) Stevens Home, Rancho Santa Fe, California: solar-energy-system performance evaluation, October 1981-April 1982.** Wetzel, P.E. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 73p. NTIS, PC A04/MF A01. Order Number DE82021698.

The Stevens Home in California is a single family residence whose active solar energy system is designed to supply 70% of the hot water load. The system is equipped with 68 square feet of flat plate collectors, a 120-gallon solar preheat water tank, and a 40-gallon propane water heater. The solar fraction predicted by computer simulation and measured were the same, 44%. The system solar savings ratio, conventional fuel savings, and solar system coefficient of performance for the period covered are given. Monthly performance data are tabulated for the overall system and for the collector, storage, and domestic hot water subsystems. System operation is illustrated for a typical day by graphs of the temperatures at collector array, inlet and outlet, and at the preheat tank, and of

water consumption. The typical operating sequence and solar energy use and heat losses are also graphed. (LEW)

59400 **(SOLAR/1120—82/14) Karasek Home, Blackstone, Massachusetts solar-energy-system performance evaluation, November 1981-March 1982.** Raymond, M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 89p. NTIS, PC A05/MF A01. Order Number DE82021302.

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The Karasek Home is a single family Massachusetts residence whose active-solar-energy system is equipped with 640 square feet of trickle-down liquid flat-plate collectors, storage in a 300-gallon tank and a 2000-gallon tank embedded in a rock bin in the basement, and an oil-fired glass-lined 40-gallon domestic hot water tank for auxiliary water and space heating. Monthly performance data are tabulated for the overall system and for the collector, storage, space heating, and domestic hot water subsystems. For each month a graph is presented of collector array efficiency vs the difference between the inlet water temperature and ambient temperature divided by insolation. Typical system operation is illustrated by graphs of insolation and temperatures at different parts of the system vs time for a typical day. The typical system operating sequence for a day is also graphed as well as solar energy utilization and heat losses. (LEW)

59401 **(SOLAR/2076—82/14) Oakmead Industries, Santa Clara, California: solar-energy-system performance evaluation, June 1981-April 1982.** Pakkala, P.A. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1980. Contract AC01-79CS30027. 99p. NTIS, PC A05/MF A01. Order Number DE82021353.

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The Oakmead Industries solar energy site is a commercial office/manufacturing building in California whose solar energy system is designed to supply 85% of the space heating load and 90% of the hot water load. The system is equipped with 2622 square feet of liquid flat plate collectors, 1675 square feet of Trombe wall, and 6500-gallon steel storage tank. Auxiliary space heating is via two gas-fired heating units, and auxiliary domestic hot water is via electric resistance type water heater. The system was found to have supplied only 50% of the space heating and 47% of the hot water heating load. Also given for the reporting period are the solar savings ratio, conventional fuel savings, system performance factor, and solar system coefficient of performance. Monthly performance data are tabulated for the system overall and for the liquid collector, storage, domestic hot water, space heating subsystems. Typical system operation is illustrated by graphs of temperatures at the collector inlet and outlet and in storage for a typical day, and the system operating sequence and solar energy utilization and losses are graphed. (LEW)

59402 **(SOLAR/2080—82/14) Taos State Office Building, Taos, New Mexico: solar-energy-system performance evaluation, June 1981-March 1982.** Raymond, M.G. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 85p. NTIS, PC A05/MF A01. Order Number DE82021356.

The Taos State Office Building is a single-story New Mexico office building which incorporates an integrated passive solar heating and daylighting system. The system is designed to provide 70% of the heating load. Solar energy enters the building via 11 rows of clerestory windows, south-facing windows, and east and west window scoops. Collected solar energy is stored in 14,080 gallons of water contained in drums in the clerestory area, as well as in the masonry construction mass of the structure. Auxiliary heating is via electric strips located in the supply ducts. Daylighting to work areas is provided through the clerestory windows and is regulated by movable insulated shutters which are used to reduce heat loss at night. The fraction of heating supplied by solar energy was measured to be 58%, corresponding to a savings of 3649 gallons of no. 2 heating oil, 495,720 cubic feet of natural gas, of 88,920 kWh of electricity. Monthly performance data are tabulated for the overall system, and for the collector, storage, and space heating subsystems. Also tabulated are monthly building environment data. A summary graph is also included for each month. (LEW)

59403 **(SOLAR/2118—82/14) Telluride School, Telluride, Colorado solar-energy-system performance evaluation, February 1982-April 1982.** Welch, K.M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 80p. NTIS, PC A05/MF A01. Order Number DE82021304.

The Telluride School solar site is an elementary/junior-senior high school in Colorado with a passive/active hybrid solar energy system designed to supply 40% of the heating load. It is equipped with a 1428 square foot, double glazed Trombe wall, a 1392 square foot greenhouse with collection tube, and an auxiliary oil-fired boiler. Monthly performance data are tabulated for the overall system and for the Trombe wall, greenhouse, and greenhouse storage. System operation is illustrated by graphs of typical Trombe wall insolation and temperatures and typical greenhouse insolation and temperatures. (LEW)

59404 **(SOLAR/2120—82/14) Carter County Visitor's Center, Grayson, Kentucky: solar-energy-system performance evaluation, December 1981-February 1982.** Welch, K.M. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 72p. NTIS, PC A04/MF A01. Order Number DE82021697.

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The Carter County Visitor's Center in Kentucky is a Port of Entry Facility whose active solar energy is equipped with 1080 square feet of flat plate collectors, a 1500-gallon water tank, a 120-gallon electric domestic water heater, three water-to-air heat pumps, and a 64 kW auxiliary boiler. Of the total system space and water heating load, 6% was provided by solar energy. Other data summarized for the period are the solar savings ratio, conventional fuel savings, system performance factor, and solar system coefficient of performance. Monthly performance data are tabulated for the overall system and for the collector, storage, domestic hot water, and space heating subsystems. Operation for a typical day is illustrated by graphs of temperatures at various points of the system, water consumption, pump power, and insolation vs. time. Also graphed are typical system operating sequence and solar energy utilization and heat losses. (LEW)

59405 **(SOLAR/2122—82/14) EROS Data Center, Sioux Falls, South Dakota: solar-energy-system performance evaluation, October 1981-April 1982.** Wetzel, P.E. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 76p. NTIS, PC A05/MF A01. Order Number DE82021703.

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The EROS Data Center in South Dakota is a government facility whose active solar energy system is equipped with 9124 square feet of flat plate collectors, 26,893 gallons of hot water storage in an underground vault, and two auxiliary electric hot water boilers. The system provided 40% of the hot water load for the recording period. Other performance data for the period include the solar savings ratio, conventional fuel savings, system performance factor, and solar system coefficient of performance. Monthly performance data are tabulated for the system overall and for the collector and hot water subsystems. System operation for a typical day is illustrated by graphs of insolation and collector and storage temperatures vs. time and of typical water consumption. The typical operating sequence is also graphed. (LEW)

59406 **(SOLAR/2125—82/14) Wood Road School, Ballston Spa, New York solar-energy-system performance evaluation, November 1981-April 1982.** Kendall, P. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1982. Contract AC01-79CS30027. 86p. NTIS, PC A05/MF A01. Order Number DE82021301.

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The Wood Road School Solar Project of the Ballston Spa Central School District is a 216,000 square foot (136,510 square feet of solar conditioned space) combined elementary and middle school located in New York. The solar energy system was designed to supply 64% of the space heating and 88% of the hot water. The system is equipped with 15,389 square feet of one type of flat-plate collector panels and 6650 square feet of another type. Storage is in two 15,000-gallon storage tanks, and auxiliary heating is by electric

resistance strip heaters. Monthly performance data are tabulated for the overall system and for each type of collector, storage, domestic hot water, and space heating subsystems. Also tabulated monthly are weather condidons, energy savings, operating energy, and coefficients of performance. Also provided are graphs of collector array efficiency vs the difference between the fluid inlet temperature and ambient temperature divided by insolation. System operation is illustrated by graphs of collector array inlet/outlet temperatures and ambient temperature and typical building loop temperatures vs time for a typical day. Also graphed are the system operating sequence and the solar energy utilization and energy losses. (LEW)

1410 Solar Collectors And Concentrators

59407 **(SAND—82-8190) Investigation of free-forced convection flows in cavity-type receivers.** Humphrey, J.A.C.; Sherman, F.S.; Chen, K.S.; To, W.M. (Sandia National Labs., Livermore, CA (USA); California Univ., Berkeley (USA). Dept. of Mechanical Engineering). Jul 1982. Contract AC04-76DP00789. 15p. NTIS, PC A02/MF A01. Order Number DE82020118.

A numerical calculation procedure applicable to cavity-type receiver configurations and flow conditions was developed. Flow visualization experiments were performed, and experimental measurements of quantities valuable for the development of the numerical calculation procedure were made. The investigation is focussed on a configuration which is strongly two-dimensional in the mean flow structure (but turbulent in a truly three-dimensional sense). (LEW)

59408 **(SERI/TR—253-1450) Structural design considerations for a line-focus reflective module using inexpensive composite materials.** Murphy, L.M. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1982. Contract AC02-77CH00178. 59p. NTIS, PC A04/MF A01. Order Number DE82021611.

Addressed is the progress to date on the structural design aspects of a novel parabolic trough reflective module. The reflective module is a lightweight, low-flexural-rigidity design that is rotated about the focal line. The modules and support frame are designed to rotate with a cable-drive system in a cross-row manner. Analysis indicates that the structural and optical aspects of the reflector frame concept are adequate, with dramatic savings in weight and costs for the structure. Recommendations for next-generation design improvements are also made.

59409 **(UCRL—53220) Distant-observer techniques for verification of solar-concentrator optical geometry.** Wood, R.L. (Lawrence Livermore National Lab., CA (USA)). 30 Oct 1981. Contract W-7405-ENG-48. 47p. NTIS, PC A03/MF A01. Order Number DE82021537.

Existing methods for testing the geometric accuracy of parabolic trough concentrators are too slow and require too much hardware and system downtime to be of use in field testing of large industrial solar installations. Distant observer techniques are developed to permit a variety of in the field tests to be made quickly and with very little equipment. Diagnostic procedures for most correctable faults are discussed.

59410 **Apparatus and method for continuous electroplating.** Conlon, T.P. Jr.; Holmes, S.D. (to Dept. of Energy). US Patent Application 323,149. 19 Nov 1981. 22p. Contract AC04-76DP00789.

An apparatus and method are disclosed for performing a continuous electroplating process upon an elongate conductive stock article. A closed housing assembly retaining an electroplating solution and having a conductive housing body and flexible, nonconductive end walls is connected to the positive pole of a source of electromotive force. The end walls have an aperture for receiving the conducting stock article in sliding and sealing contact. The stock article is connected to the negative pole of the source of electromotive force. The conductive housing body and the section of the conductive stock article within the housing body are coextensive, coaxial and spaced a uniform distance apart. The housing body has an inlet at the bottom and an outlet at the top allowing the housing assembly to fill completely with plating solution. The inlet has a reduced nozzle to create turbulence and spiral circulating motion of the plating solution moved by a pump connected by nonconductive conduits. The solution is circulated through an open reservoir. A coolant may be conveyed through the interior in a hollow stock article to cool the surface being electroplated. Different sizes of coaxial metal insert sleeves may be telescopically received in the housing body.

1420 Heat Storage

REFER ALSO TO CITATION(S) 59623, 59679

59411 **(CONF-820827—12) Development of heat-storage building materials for passive-solar applications.** Fletcher, J.W. (Lockheed Missiles and Space Co., Inc., Huntsville, AL (USA). Research and Engineering Center). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020804.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The main objective of this project is to develop a heat storage building material to be used for passive solar applications and general load leveling within building spaces. Specifically, PCM-filled plastic panels are to be developed as wallboard and ceiling panels. Three PCMs ($CaCl_2$. $6H_2O$; Na_2SO_4 . $10H_2O$; $LiNO_3$. $3H_2O$) are to be evaluated for use in the double-walled, hollow-channeled plastic panels. Laboratory development of the panels will include determination of filling and sealing techniques, behavior of the PCMs, container properties and materials compatibility. Testing will include vapor transmission, thermal cycle, dynamic performance, accelerated life and durability tests. In addition to development and testing, an applications analysis will be performed for specific passive solar applications. Conceptual design of a single family passive solar residence will be prepared and performance evaluated. Screening of the three PCM candidates is essentially complete. The behavior of the three has been observed in the selected polypropylene panels, and calcium chloride hexahydrate has been determined to behave the best. Considerable problems were encountered with sealing of the panels; however, a satisfactory sealing technique (pressure-heat seal) has been developed. The PCM behaved much more reliably with the channels oriented horizontally during preliminary thermal cycling tests. The test chamber design, instrumentation and data reduction techniques have been determined, construction and check-out of the test chamber have been completed and formal thermal cycling tests are to begin in August. Vapor transmission tests for the panels were begun in April.

59412 **(DOE/ET/20422—1) Storage-fluid maintenance study using Caloria HT-43 hydrocarbon oil. Final report for September 1977 to November 1978.** Beshore, D.G.; Myers, J.E.; Morgan, W.R.; Barth, M.G. (Martin Marietta Aerospace Corp., Denver, CO (USA)). Apr 1979. Contract AC03-76ET20422. 424p. NTIS (US Sales Only). Order Number DE82021806.

Portions of document are illegible.

Thermal energy storage concepts using hydrocarbon oils are being considered in first generation solar thermal power feasibility studies and plant development efforts. The thermal degradation characteristics of Exxon's Caloria HT-43 oil have been investigated. The program has been accomplished under two phases of effort. Phase I has studied the thermophysical effects of oil degradation in a partially vented storage tank at 316°C (600°F) for a period of 1000 hours. Phase II has examined the effect of a sidestream processor (vacuum distillation column) on oil degradation in a vented storage tank. Test results indicate that the thermal degradation process is autocatalytic. Therefore, both tank venting and oil reprocessing can actually reduce the degradation rate. The experimentally determined degradation rates under the two phases of effort were, in Phase I, 2.4 percent by weight per week and, in Phase II, 0.1 percent by weight per week. However, computed fluid replenishment rates were in Phase I and II, 1.1 and 0.8 percent, respectively. Improved processor designs could substantially lower the 0.8 percent per week observed for the Phase II sidestream processor.

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

59413 **(DOE/ID/12101—4) State geothermal commercialization programs in seven Rocky Mountain states. Semiannual progress report, January-July 1981.** Lunis, B.C.; Toth, W.J. (comps.). (EG and G Idaho, Inc., Idaho Falls (USA)). May 1982. Contract AC07-76ID01570. 226p. NTIS, PC A11/MF A01. Order Number DE82021876.

The activities and findings of the seven state commercialization teams participating in the Rocky Mountain Basin and Range commercialization program are described. For each state (Colorado, Montana, New Mexico, North and South Dakota, Utah, and Wyoming), prospect identification, area development plans, site specific development analyses, time-phased project plans, the aggregated prospective geothermal energy use, and institutional analyses are discussed. Public outreach activities are also covered, and findings and recommendations are given for each state. Some background information about the program is provided. (LEW)

59414 **(ORAU/IEA—82-7(M)) Geothermal-resource survey of the Tennessee Valley Region.** Staub, W.P.; Treat, N.L. (Oak Ridge Associated Universities, Inc., TN (USA)). Aug 1982. Contract AC05-76OR00033. 133p. NTIS, PC A07/MF A01. Order Number DE82021951.

Portions of document are illegible.

An overview appraisal of the geothermal resources in the Tennessee Valley Region revealed geothermal resources of potential usefulness in two of 13 subregions: the New Madrid Seismic Zone and the central segment of the Northern Gulf Coastal Plain. The appraisal was based on geologic features of the region (hot springs, groundwater aquifers, and structure) and temperature data for oil and gas wells and shallow water wells. Site-specific exploration for economic appraisal was not carried out. The geothermal gradient for each of the subregions was established by linear regression of all of the bottom-hole temperature data for the oil and gas wells. A routine statistical procedure identified all unusually warm wells within each subregion, and their locations were plotted. Hot spots in a subregion were identified by localized clustering of such wells in numbers exceeding statistical expectations based on the intensity of drilling activity. Of the two areas most likely for extraction of geothermal energy, the New Madrid Seismic Zone has a high geothermal gradient at shallow depths (less than 500 meters). However, the higher gradient does not continue at greater depth since convective circulation is the probable cause of the higher-than-normal groundwater temperatures. Although a high geothermal gradient does persist at depth in the central segment of the Northern Gulf Coastal Plain, engineering problems are likely to hinder the current economic use of geothermal energy in this subregion. The extraction of geothermal resources in the 11 other subregions is not considered to be feasible at present because (1) the heat source is too deep, or (2) there are no suitable aquifers.

1502 Geology And Hydrology Of Geothermal Systems

REFER ALSO TO CITATION(S) 59422, 59424, 59435, 59445

59415 **(CONF-821009—1) Clay mineralogy and depositional history of the Frio Formation in two geopressured wells, Brazoria County, Texas.** Freed, R.L. (Trinity Univ., San Antonio, TX (USA)). 1982. Contract AC08-79ET27111. 20p. NTIS, PC A02/MF A01. Order Number DE82016166.

From 32. annual meeting of the Gulf Coast Association of Geological Societies; Houston, TX, USA (26 Oct 1982).

Twenty-three shale samples ranging in depth from 5194 ft to 13,246 ft from Gulf Oil Corporation No. 2 Texas State Lease 53034 well and 33 shale samples ranging in depth from 2185 ft to 15,592 ft from General Crude Oil Company/Department of Energy No. 1 Pleasant Bayou well were examined by x-ray techniques to determine the mineralogy of the geopressured zone in the Brazoria Fairway. Both wells have similar weight-percent trends with depth for a portion of the mineralogy. Calcite decreases, and plagioclase, quartz and total clay increase slightly. Within the clays, illite in mixed-layer illite/smectite (I/S) increases and smectite in mixed-layer I/S decreases. Four minerals have distinctly different trends with depth for each well. In the No. 2 Texas State Lease 53034 well, potassium feldspar and mixed-layer I/S decrease, kaolinite increases, and discrete illite is constant. In the No. 1 Pleasant Bayou well, potassium feldspar and kaolinite are constant, mixed-layer I/S increases, and discrete illite decreases.

59416 **(CONF-821009—2) Elements of high constructive deltaic sedimentation, lower Frio Formation, Brazoria County, Texas.** Tyler, N.; Han, J.H. (Texas Univ., Austin (USA). Bureau of Economic Geology). 1982. Contract AC08-79ET27111. 33p. NTIS, PC A03/MF A01. Order Number DE82016920.

From 32. annual meeting of the Gulf Coast Association of Geological Societies; Houston, TX, USA (26 Oct 1982).

Portions of document are illegible.

The lower Frio Formation in eastern Brazoria County, upper Texas Gulf Coast, was deposited in a high constructive deltaic environment in the Houston delta system. Constructive elements of the stacked, elongate to lobate deltas that were intersected in core are storm induced delta front splays, delta front slump deposits, and distributary mouth bar, distributary channel and delta plain assemblages. Reworked and winnowed abandonment facies that are volumetrically insignificant relative to constructive elements are subdivided into a crossbedded shoreface-foreshore subfacies and a fine grained cyclic sequence of storm deposits on the lower shoreface that represent a distal abandonment subfacies. Micropaleontological evidence indicates that deposition of constructive and abandonment facies took place in water depths of less than 120 feet.

59417 **(LA-UR—82-1710) Evidence of former higher temperatures from alteration minerals, Bostic 1-A well, Mountain Home, Idaho.** Arney, B. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—11). NTIS, PC A02/MF A01. Order Number DE82018412.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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Cuttings from the silicic volcanics in the Bostic 1-A well near Mountain Home, Idaho have been examined petrographically with the assistance of x-ray diffraction and electron microprobe analyses. Results indicate that these rocks have been subjected to much higher temperatures than were observed in the well in 1974, when a static temperature log was run. It is not known to what extent the alternation may be due to greater depth of burial in the past, or whether it resulted from an early hydrothermal system of higher temperature than the one now observed.

59418 **(LBL—13897) Microfaunal evidence of age and depositional environments of the Cerro Prieto section (Plio-Pleistocene), Baja California, Mexico.** Ingle, J.C. Jr. (Stanford Univ., CA (USA)). Jan 1982. Contract AC03-76SF00098. 28p. NTIS, PC A03/MF A01. Order Number DE82020570.

Microfossils including benthic and planktic foraminifera, ostracodes, calcareous algae, fish skeletal material, and fragments of pelecypods were found in 14 core samples from depths of 185 to 1952 m in the Cerro Prieto geothermal field, providing evidence of both the age and depositional history of sediments comprising the 3000-m-thick Pliocene and Pleistocene section in this area. Ostracodes of brackish water and marine origin constitute the most common microfossils present in this sequence occurring in 8 samples; in situ littoral and neritic species of benthic foraminifera occur in 5 samples with planktic species present in 2 samples. Distributional patterns of ostracodes and foraminifera together with previously analyzed lithofacies (Lyons and van de Kamp, 1980) indicate that the Cerro Prieto section represents an intertonguing complex of alluvial, deltaic, estuarine, and shallow marine environments deposited along the front of the Colorado River delta as it prograded across the Salton Trough during Pliocene and Pleistocene time. Foraminiferal evidence indicates that a sand and shale unit commonly present at depths between 700 and 1100 m represents a significant mid-Pleistocene marine incursion in the Cerro Prieto area. Tentative correlation of the Cerro Prieto section with the well

dated Palm Springs Formation of the Imperial Valley, California area suggests that the Pliocene/Pleistocene boundary occurs at a depth of approximately 2000 m in the area of well M-93. Reworked specimens of Cretaceous foraminifera and fragments of the Cretaceous pelecypod Inoceramus were found in five samples further substantiating the Colorado Plateau provenance of a significant portion of the Colorado River deltaic sediments in the Cerro Prieto area.

59419 **(LBL—14534) Identification of fluid-flow paths in the Cerro Prieto geothermal field.** Halfman, S.E.; Lippmann, M.J.; Zelwer, R.; Howard, J.H. (Lawrence Berkeley Lab., CA (USA); Lawrence Livermore National Lab., CA (USA)). May 1982. Contract W-7405-ENG-48. 4p. (CONF-821007—12). NTIS, PC A02/MF A01. Order Number DE82018619.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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A hydrogeologic model of the Cerro Prieto geothermal field has been developed based on geophysical and lithologic well logs, downhole temperature, and well completion data from about 90 deep wells. The hot brines seem to originate in the eastern part of the field, flowing in a westward direction and rising through gaps in the shaly layers which otherwise act as partial caprocks to the geothermal resource.

59420 **(USGS-OFR—80-2043) Hydrology and geochemistry of thermal ground water in southwestern Idaho and north-central Nevada.** Young, H.W.; Lewis, R.E. (Geological Survey, Washington, DC (USA)). Dec 1980. 57p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

Portions of document are illegible.

The study area occupies about 14,500 square miles in southwestern Idaho and north-central Nevada. Thermal ground water occurs under artesian conditions, in discontinuous or compartmented zones, in igneous or sedimentary rocks of Tertiary age. Groundwater movement is generally northward. Temperatures of the ground water range from about 30° to more than 80°C. Chemical analyses of water from 12 wells and 9 springs indicate that nonthermal waters are a calcium bicarbonate type; thermal waters are a sodium bicarbonate type. Chemical geothermometers indicate probable maximum reservoir temperatures are near 100°C. Concentration of tritium in the thermal water water is near zero.

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 59420, 59451

59421 **(DOE/ET/27100—1) Intermediate-depth geothermal temperature study. Gradient holes: 11-33 and 63-33, Soda Lake, NV.** Hill, D.G. (Chevron Resources Co., San Francisco, CA (USA)). Oct 1979. Contract AC08-78ET27100. 41p. NTIS, PC A03/MF A01. Order Number DE82021815.

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During 1979, Chevron Resources Company drilled two 2000 ft holes near Soda Lake in the Nevada Carson Sink area to obtain subsurface data for inclusion in the US Department of Energy's Northern Basin and Range geothermal reservoir assessment program. Drilling information together with detailed lithologic, geophysical and temperature log data were compiled for each hole and is summarized in this report. Maximum stabilized temperatures of 297°F and 367°F were encountered at total depth in each of the holes, respectively.

59422 **(DOE/ET/28406—1) Geothermal reservoir assessment, Roosevelt Hot Springs. Final report, October 1, 1977-June 30, 1982.** (Geothermal Power Corp., Novato, CA (USA)). 1982. Contract AC08-77ET28406. 81p. NTIS, PC A05/MF A01. Order Number DE82020632.

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The geology, geophysics, and geothermal potential of the northern Mineral Mountains, located in Beaver and Millard Counties, Utah, are studied. More specifically, the commercial geothermal potential of lease holdings of the Geothermal Power Corporation is addressed.

59423 **(LA-UR—82-1434) Geothermal gradient map of the conterminous United States. Second edition.** Kron, A.; Stix, J. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 4p. (CONF-821007—1). NTIS, PC A02/MF A01. Order Number DE82015727.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

The second edition of the Geothermal Gradient Map of the Conterminous United States (Kron and Stix 1982) is described and the changes made since the first edition (Kron and Heiken 1980) are compared. The second edition of the map presents a compilation of over 1700 wells that have been measured for temperature belwo 50 m and whose temperature/depth profiles are linear, or composed of linear segments which reflect changes in the thermal conductivity of the rocks rather than hydrology. The data are displayed at an enlarged scale of 1:2,500,000 and in a new format which shows the location, depth, and gradient of each well in a single color-coded symbol. This edition contains over two times the amount of data shown on the first map and is accompained by a table, listing for each well its location, depth, gradient, heat flow (where available), thermal conductivity (where available), and a reference. Over 200 references have been consulted and are presented with the data.

59424 **(LA-UR—82-1527) Geology, resistivity, and hydrochemistry of the Ojo Caliente hot springs area, northern New Mexico.** Stix, J.; Pearson, C.; Vuataz, F.; Goff, F.; East, J.; Hoffers, B. (Los Alamos National Lab., NM (USA); Alaska Univ., Fairbanks (USA). Dept. of Geology). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—6). NTIS (US Sales Only). Order Number DE82018385.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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Geothermal fluids of the Ojo Caliente area discharge from a northeast trending normal fault that juxtaposes Precambrian metarhyolite and Tertiary sediments. An electrical resistivity survey shows that the fluids emerge from the fault and flow as a plume of thermal water into cold aquifers east of the fault. Geochemistry of fluids indicates a maximum reservoir temperature at depth of 80°C with no suggestion of high temperature isotopic exchange between water and reservoir rocks. From this data, it is believed that the Ojo Caliente system is suitable only for small-scale direct use geothermal applications.

59425 **(LBL—14319) Deep electromagnetic sounding in central Nevada.** Wilt, M.; Goldstein, N.E.; Haught, J.R.; Morrison, H.F. (Lawrence Berkeley Lab., CA (USA)). Apr 1982. Contract AC03-76SF00098. 7p. (CONF-821025—1). NTIS, PC A02/MF A01. Order Number DE82020065.

From Annual meeting on the Society of Exploration Geophysicists; Dallas, TX, USA (17 Oct 1982).

Sixteen shallow and deep controlled source electromagnetic soundings were performed in Buena Vista Valley, near Winnemucca, Nevada, to investigate an intra-basement conductor previously detected with magnetotellurics. The survey was carried out with the LBL EM-60 system using a remote magnetic reference for low-frequency geomagnetic noise cancellation, 100-m- and 2.8-km-diameter transmitter loops, and a minicomputer for in-field processing. EM soundings were made at distances from 0.5 to 30 km from three loops over the frequency range 0.02 to 500 Hz. Data were interpreted by means of 1-D inversions and the resulting layered models were pieced together to yield an approximate 2-D geoelectric model along the N-S axis of the valley. The EM soundings and one MT sounding show a 3 to 7 ohm-m zone at a depth of four to seven km. The conductor appears to be deepest at the northern end of the valley and shallowest beneath a basement ridge that seems to divide Buena Vista Valley into two basinal structures. Similar intrabasement conductors are also reported 50 to 75 miles south in the Carson Sink-Fallon areas, suggesting a common source, probably related to an anomalously hot, thin crust.

59426 **(USGS-OFR—79-1129) Deep-drilling data, Raft River geothermal area, Idaho: Raft River geothermal injection well No. 6.** Covington, H.R. (Geological Survey, Washington, DC (USA)). 1979. 24p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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The drilling data include the litholog and the following logs: dual induction-focused, acoustilog, compensated neutron, gamma, compensated densilog, and temperature.

59427 **(USGS-OFR—79-1308) Audio-magnetotelluric data log and station-location map for the Ennis Hot Springs area, Montana.** Long, C.L.; Senterfit, R.M. (Geological Survey, Washington, DC (USA)). 1979. 7p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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Twenty audio-magnetotelluric soundings collected to assist in a regional evaluation of the geothermal potential of the Ennis Hot Springs area are presented.

59428 **(USGS-OFR—79-1365) Deep-drilling data, Raft River geothermal area, Idaho: Raft River geothermal injection well 7.** Covington, H.R. (Geological Survey, Washington, DC (USA)). 1979. 24p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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The data include dual induction-focused log, acoustilog, compensated neutron log, gamma log, compensated densilog, temperature log, and lithology.

59429 **(USGS-OFR—80-518) Telluric profiles and location map for Vulcan Hot Springs known geothermal resource area, Idaho.** Christopherson, K.R.; Senterfit, R.M.; Dalati, M. (Geological Survey, Washington, DC (USA)). 1980. 4p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

Two telluric profiles made near Vulcan Hot Springs are presented and described.

59430 **(USGS-OFR—80-612) Survey of helium in soil gases of Long Valley, Califorina.** Hinkle, M.E.; Kilburn, J.E. (Geological Survey, Washington, DC (USA)). 1980. 21p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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Soil and water samples in and around the Long Valley geothermal area, Mono County, California, were collected and analyzed for helium by means of a modified mass spectrometer leak detector to see what relationship helium concentrations might have to geothermal features of the area, and to previously studied mercury anomalies in the area. Anomalously high concentrations of helium occurred over part of a major Sierra Nevada frontal fault and over other faults outside of the caldera. Anomalously low concentrations of helium occurred in several areas of high mercury concentrations, which were also areas of hydrothermal alteration. Quantities of helium exsolved from water samples did not fit any pattern.

59431 **(USGS-OFR—81-80) Chemistry of thermal waters and mineralogy of the new deposits at Mount St. Helens: a preliminary report.** Dethier, D.P.; Frank, D.; Peavear, D.R. (Geological Survey, Seattle, WA (USA); Western Washington Univ., Bellingham (USA)). Dec 1980. 24p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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After May 18, 1980 eruption of Mount St. Helens, Washington, interactions between the hot deposits and shallow ground water produced ephemeral phreatic eruptions and thermal ponds and streams. In early June water and sediment samples were collected from about 20 sites in the devastated zone to study the initial alteration of the new deposits, and the effects of the eruption on water chemistry. The levels of certain trace elements in thermal waters, and whether these mineralized waters were reaching the North Fork Toutle River in appreciable quantities were studied. Collection and analysis procedures, the mineralogy of the new deposits, and the chemistry of the thermal waters are discussed. Finally, the chemistry of water from different deposits is compared, alteration reactions suggested by the water chemistry, and the mineralogy of the deposits is discussed.

59432 **(USGS-OFR—81-188) Principal facts for gravity stations of the Broadwater geothermal area, Montana.** Bankey, V.; Paton, J.; Kleinkopf, M.D. (Geological Survey, Washington, DC (USA)). 1981. 13p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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Two complete Bouguer anomaly values were calculated for each of the 67 stations assuming average rock densities of 2.67 g/cm^3 and 2.45 g/cm^3. The corrections and anomaly values are listed. A hand contoured Bouguer gravity map is included.

59433 **(USGS-OFR—81-411) Data from geothermal wells near Oasis, lower Coachella Valley, California.** Robison, J.H. (Geological Survey, Menlo Park, CA (USA)). 1981. 28p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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Drillers' logs, temperature logs, and water quality analyses from geothermal tests made at 11 sites near Oasis, lower Coachella Valley, California, are presented. The wells were drilled in 1978 under contract to the US Geological Survey as part of an appraisal of geothermal resources in the lower Coachella Valley.

59434 **(USGS-OFR—81-834) Shallow hydrothermal regime of the East Brawley and Glamis known geothermal resource areas, Salton Trough, California.** Mase, C.W.; Sass, J.H.; Brook, C.A.; Munroe, R.J. (Geological Survey, Washington, DC (USA)). 1981. 59p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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Thermal gradients and thermal conductivities were obtained in real time using an in situ heat-flow technique in 15 shallow (90 to 150 m) wells drilled between Brawley and Glamis in the Imperial Valley, Southern California. The in situ measurements were supplemented by follow-up conventional temperature logs in seven of the wells and by laboratory measurements of thermal conductivity on drill cuttings. The deltaic sedimentary material comprising the upper $\sim$ 100 m of the Salton Trough generally is poorly sorted and high in quartz resulting in quite high thermal conductivities (averaging 2.0 Wm^{-1} K^{-1} as opposed to 1.2 to 1.7 for typical alluvium). A broad heat-flow anomaly with maximum of about 200 mWm^{-2} ($\sim$ 5 HFU) is centered between Glamis and East Brawley and is superimposed on a regional heat-flow high in excess of 100 mWm^{-2} ($>$ 2.5 HFU). The heat-flow high corresponds with a gravity maximum and partially with a minimum in electrical resistivity, suggesting the presence of a hydrothermal system at depth in this area.

59435 **(USGS-OFR—81-915) Hydrothermal system in Southern Grass Valley, Pershing County, Nevada.** Welch, A.H.; Sorey, M.L.; Olmsted, F.H. (Geological Survey, Menlo Park, CA (USA)). 1981. 207p. USGS Open File Service, Box 25425 Denver Federal Center, Denver, CO 80225.

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Southern Grass Valley is a fairly typical extensional basin in the Basin and Range province. Leach Hot Springs, in the southern part of the valley, represents the discharge end of an active hydrothermal flow system with an estimated deep aquifer temperature of 163 to 176°C. Results of geologic, hydrologic, geophysical and geochemical investigations are discussed in an attempt to construct an internally consistent model of the system.

59436 **(USGS-OFR—81-979) Interpretation of time-domain electromagnetic soundings in the East Rift geothermal area of Kilauea Volcano, Hawaii.** Kauahikaua, J. (Geological Survey, Washington, DC (USA)). 1981. 25p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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A controlled-source time-domain electromagnetic (TDEM) sounding survey was completed on the lower portion of the East Rift of Kilauea Volcano, Hawaii (locally known as the Puna area) during the summer of 1974 as part of the geophysical task of the Hawaii Geothermal Project. Interpretations as obtained by a layered-earth TDEM inversion computer program are presented. Interpretations in terms of layered half-space models can be used to localize low-resistivity zones vertically as well as horizontally. The results show that much of the area is underlain by an anomalously conductive zone at depths of 250 to 1300 below sea level. Twenty-four TDEM soundings were attempted in the area using four different grounded wire current sources and a 42-conductor, horizontal loop sensor. The TDEM sounding data were in the form of voltages (proportional to the time derivative of the induced magnetic field) measured at discrete times after a break in the source current. Seventeen of the soundings are interpreted here.

59437 **(USGS-OFR—81-1002) Data from geothermal test wells near Mount Hood, Oregon.** Robison, J.H.; Forcella, L.S.; Gannett, M.W. (Geological Survey, Washington, DC (USA)). 1981. 27p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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Well specifications, drillers' logs, and temperature logs of geothermal test wells drilled at 7 sites near Mt. Hood, Oregon are presented.

59438 **(USGS-OFR—81-1044) Geophysical reconnaissance of prospective geothermal areas on the island of Hawaii using electrical methods.** Kauahikaua, J.; Mattice, M. (Geological Survey, Washington, DC (USA); Hawaii Univ., Honolulu (USA). Hawaii Inst. of Geophysics). Jul 1981. 66p. USGS-Open File Service, Box 25425 - Denver Federal Center, Denver CO 80225.

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Resistivity data from several areas were compiled, analyzed, and interpreted in terms of possible geologic models. On the basis of this analysis alone, two areas have been ruled out for possible geothermal exploitation, two have been interpreted to have a moderate-temperature resource, and two have been interpreted to have a high-temperature resource. The two areas which have been ruled out are the Keaau and South Point areas. The Kawaihae area and the lower northwest rift zone of Hualalai appear to have anomalous resistivity structures, which suggest a moderate-temperature resource in each of these areas. Finally, specific areas in the lower southwest and lower east rift zones of Kilauea have been outlined as locations where high-temperature fluids may exist at depth.

1504 Legal And Institutional Aspects

REFER ALSO TO CITATION(S) 59441

59439 **(WAOENG—82-04) Guide to a geothermal heat plan: a geothermal energy application. Serial No. 3.** (Washington State Energy Office, Olympia (USA)). Mar 1982. Contract FG07-79R000079. 39p. NTIS, PC A03/MF A01. Order Number DE82020591.

The concept of a heat plan is introduced so that local officials may become familiar with thermal considerations and determine which options deserve further study and action. The approach for formulating a heat plan is a two-part process where heat resources and end-uses are first characterized in a heat atlas and then acted upon according to goals and strategies embodied in the plan. The purpose of the atlas is to systematically monitor a community's thermal supplies and demands, and to catalog them in the same manner as other community development sectors. The heat plan contains thermal goals and implementation measures based on conditions and opportunities revealed in the atlas. The heat demands considered in the atlas include space, water, and industrial process heat demands. Thermal resources considered include those conventional fuels already in use, as well as those alternate energy resources which have potential for utilization. (LEW)

1505 Economic And Financial Aspects

REFER ALSO TO CITATION(S) 59454

59440 **(NP—2906085) Guide to financing: small-scale geothermal energy projects.** (Allen (Eliot) and Associates, Inc., Salem, OR (USA)). Apr 1982. 29p. NTIS, PC A03/MF A01. Order Number DE82906085.

A brief overview is given of the current financing sources for projects requiring $1 million or less in capital investment and the major considerations commonly encountered in assembling financing. A directory of technical and financial assistance and a glossary of geothermal/financial terms are included.

59441 **(WAOENG—82-03) Institutional and financial guide to geothermal district heating. Serial No. 2.** (Washington State Energy Office, Olympia (USA)). Mar 1982. Contract FG07-79R000079. 29p. NTIS, PC A03/MF A01. Order Number DE82020567.

General planning considerations which affect nearly every community are reviewed, and alternative operating structures which are available to communities are reviewed, including local governments, nonprofit cooperatives, private enterprises, and joint ventures. The financing options available to publicly-owned and privately-owned district heating systems are then summarized. The geothermal production and distribution activities most appropriate to each type of operating structure are reviewed, along with typical equity and debt funding sources. The tax advantages for private developers are described, as are the issures of customer contracts and service prices, and customer retrofit financing. The treatment is limited to an introductory overview. (LEW)

1506 Environmental Aspects And Waste Disposal

59442 **(UCID—19497) Geothermal Injection Monitoring Project. Phase I status report, April 1981-April 1982.** Younker, L.; Hanson, J.; Didwall, E.; Kasameyer, P.; Smith, A.; Hearst, J.; Daily, W.; Crow, N.; Younker, J.; Murray, W. (Lawrence Livermore National Lab., CA (USA)). 13 Aug 1982. Contract W-7405-ENG-48. 154p. NTIS, PC A08/MF A01. Order Number DE82021949.

The feasibility of using remote geophysical techniques to monitor the movement of injected brine has been evaluated. It was established that no single approach is likely to be identified that can be used to accurately monitor the precise location of the injected fluid. Several approaches have been considered in parallel because they add new dimensions to the existing monitoring capabilities, and are likely to cover a range of applications at a variety of geothermal sites. These include: microseismicity - a seismic net is used to record small magnitude events associated with injection; streaming potential - self potential anomalies produced by a moving fluid identify fluid flow direction; cross borehole geotomography - two-dimensional image of flow pathways is constructed using electromagnetic waves; and well pressure response to solid earth tide - changes in pore pressures are used to discriminate fracture/pore porosity and estimate fracture orientations.

1508 Geothermal Power Plants

59443 **(DOE/ID/01719—5) Development of geothermal binary-cycle working-fluid properties: information and analysis of cycles. Final report.** Starling, K.E.; Malik, Z.I.; Chu, C.T. (Oklahoma Univ., Norman (USA). School of Chemical Engineering and Materials Science). 30 Sep 1981. Contract AS07-78ID01719. 7p. NTIS, PC A02/MF A01. Order Number DE82021542.

Efforts were directed principally to the following tasks: (1) comparisons of mixture and pure fluid cascade cycles, (2) development of guidelines for working fluid selection for single boiler cycles, (3) continued evaluation of mixtures as working fluids, (4) working fluid thermophysical property correlation and presentation of properties information, (5) support to the INEL Conversion Technology Program.

59444 **(PNL—4053) Economic evaluation of four types of dry/wet cooling applied to the 5-MWe Raft River geothermal power plant.** Bamberger, J.A.; Allemann, R.T. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1982. Contract AC06-76RL01830. 61p. NTIS, PC A04/MF A01. Order Number DE82020409.

A cost study is described which compared the economics of four dry/wet cooling systems to use at the existing Raft River Geothermal Plant. The results apply only at this site and should not be generalized without due consideration of the complete geothermal cycle. These systems are: the Binary Cooling Tower, evaporative condenser, Combin-aire, and a metal fin-tube dry cooling tower with deluge augmentation. The systems were evaluated using cooled, treated geothermal fluid instead of ground or surface water in the cooling loops. All comparisons were performed on the basis of a common plant site - the Raft River 5 MWe geothermal plant in Idaho. The Binary Cooling Tower and the Combin-aire cooling system were designed assuming the use of the isobutane/water surface condenser currently installed at the Raft River Plant. The other two systems had the isobutane ducted to the evaporative condensers. Capital credit was not given to the system employing the direct condensing process. The cost of the systems were estimated from designs provided by the vendors. The levelized energy cost range for each cooling system is listed below. The levelized energy cost reflects the incremental cost of the cooling system for the life of the plant. The estimates are presented in 1981 dollars.

1509 Geothermal Engineering

59445 **(ETEC—82-11) Bibliography: injection technology applicable to geothermal utilization.** Darnell, A.J.; Eichelberger, R.L. (Energy Technology Engineering Center, Canoga Park, CA (USA)). 19 Mar 1982. Contract AC03-76SF00700. 119p. NTIS (US Sales Only). Order Number DE82020778.

Portions of document are illegible.

This bibliography cites 500 documents that may be helpful in planning, analysis, research, and development of the various aspects of injection technology in geothermal applications. These documents include results from government research; development, demonstration, and commercialization programs; selected references from the literature; symposia; references from various technical societies and installations; reference books; reviews; and other selected material. The cited references are from (1) subject searching, using indexing, storage, and retrieval information data base of the Department of Energy's Technical Information Center's on-line retrieval system, RECON; (2) searches of references from the RECON data base, of work by authors known to be active in the field of geothermal energy research and development; (3) subject and author searches by the computerized data storage and retrieval system of Chemical Abstracts, American Chemical Society, Washington, DC; and (4) selected references from texts and reviews on this subject. Each citation includes title, author, author affiliation, date of publication, and source. The citations are listed in chronological order (most recent first) in each of the subject categories for which this search was made. The RECON accession number is also given.

59446 **(LA—9483-MS) Drill-pipe severing tool with high-temperature explosive.** Koczan, S.P.; Patterson, W.W.; Rochester. R.H. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 12p. NTIS, PC A02/MF A01. Order Number DE82021839.

Portions of document are illegible.

A special-purpose borehole explosive tool designed to meet a need of the Los Alamos National laboratory Hot Dry Rock (HDR) Geothermal Energy Development Program is described. This tool's particular purpose is to sever stuck drill pipe in deep (> 4500 m), hot (> 320°C), water-filled wellbores. No commercial severing tools are known to us that can be operated at temperatures above 260°C.

59447 **(LA-UR—82-1561) Production casing for hot-dry-rock wells EE-2 and EE-3.** Nicholson, R.W.; Pettitt, R.; Sims, J. (Los Alamos National Lab., NM (USA); Well Production Testing, Carlsbad, CA (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—4). NTIS, PC A02/MF A01. Order Number DE82018380.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

The production casing for a pair of hot dry rock (HDR) energy extraction wells had to be designed for unique conditions. Two hot dry rock wells (EE-2 and EE-3) were drilled and production casing installed at Fenton Hill, NM for the Los Alamos National Laboratory HDR program. The design of the production casing and subsequent completion operations in these wells revealed that thermal cycling, anticipated operating pressures, and wear during downhole operations are major considerations for both casing specifications and installation procedures. The first well (Energy Extraction No. 2; EE-2) is intended to be the injection well and EE-3 the production well. The top joint strain in EE-3 was monitored during installation, cementing and tensioning.

59448 **(LA-UR—82-1562) Downhole cement test in a very hot hole.** Pettitt, R.A.; Cocks, G.G.; Dreesen, D.N.; Sims, J.R.; Nicholson, R.W.; Boevers, B. (Los Alamos National Lab., NM (USA); Well Production Testing, Carlsbad, CA (USA); Dow Chemical Co., Tulsa, OK (USA). Dowell Div.). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—8). NTIS, PC A02/MF A01. Order Number DE82018363.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

Completion of the commercial-sized Hot Dry Rock Geothermal Energy Project requires that hydraulic fractures be created between two inclined wellbores at a depth of about 4 km (15,000 ft). Isolation of a section of the open wellbore is necessary for pressurization to achieve the fracture connections. A cemented-in liner/PBR assembly is one of the methods used for zone isolation near the botton of the injection well. A downhole, pumped cement test was first conducted at a wellbore temperature of 275°C (525°F) to determine if a suitable slurry could be designed, pumped, and later recovered to assure the success of the cemented-in liner operation.

59449 **(LA-UR—82-1563) Precision directional drilling of hot-dry-rock geothermal production well EE-3.** Carden, R.S.; Rowley, J.C.; Helmick, C. (Los Alamos National Lab., NM (USA); Grace, Shursen, Moore and Associates, Oklahoma City, OK (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—9). NTIS, PC A02/MF A01. Order Number DE82018364.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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The deviated directional drilling of the hot dry rock (HDR) geothermal production well EE-3 (Energy Extraction No. 3) was successfully completed on August 1981. The injection well, EE-2, previously had been drilled with its lower part at an inclination of 35° to the vertical. It reached an on-line depth of 15,292 feet and its bottom-hole temperature was 608°F (320°C). The production well EE-3 was required to be drilled 1200 feet (370 m) above and parallel to the injection well. This necessitated high precision, controlled-trajectory directional drilling operations. The directional drilling of EE-3 was accomplished within the required tolerances at a depth of 13,933 feet and a bottom-hole temperature of 580°F (280°C).

59450 **(LA-UR—82-1564) Non-Darcy flow in geothermal reservoirs.** Zyvoloski, G. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—7). NTIS (US Sales Only). Order Number DE82018365.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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The effects of non-Darcy flow laws are investigated for two geothermal reservoir types: multiphase and Hot Dry Rock (HDR). Long-term thermal behavior is emphasized as short-term pressure

transient behavior is addressed in the oil field literature. Comparisons of Darcy and non-Darcy flow laws are made.

59451 **(LA-UR—82-1578) Rock failure during massive hydraulic stimulation of the Baca location geothermal reservoir.** Pearson, C.; Keppler, H.; Albright, J.; Potter, R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—5). NTIS, PC A02/MF A01. Order Number DE82018369.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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The analyses of microearthquake signals occurring during hydraulic stimulation provide an estimate of the size and location of the fractures thus produced. Studies of microearthquakes occurring during two large ($> 10^3 m^3$) hydraulic stimulations of the hydrothermal reservoir at the Baca Location in the Jemez Mountains of northeastern New Mexico are reported. Both stimulations consisted of water, viscosity enhancer, and proppant. The microearthquake event rate was low but variable throughout most of the treatment. Rock failure as indicated by the distribution of the microearthquakes' foci appeared restricted to a nearly vertical NE striking zone. This orientation is in good agreement with the local earth stresses inferred from geological considerations. The second stimulation which occurred in a neighboring well was similar to the first except for a larger injected volume. The lateral extent of the detected fracture system was 600 m in both stimulations.

59452 **(LA-UR—82-2020) GEOFRAC: an explosives stimulation technique for a geothermal well.** Mumma, D.M.; McCullough, F. Jr.; Schmidt, E.W.; Pye, D.S.; Allen, W.C.; Pyle, D.; Hanold, R.J. (Los Alamos National Lab., NM (USA); Physics International Co., San Leandro, CA (USA); Rocket Research Co., Redmond, WA (USA); Union Oil Co. of California, Los Angeles (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821007—13). NTIS, PC A02/MF A01. Order Number DE82019563.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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The first known use of explosives for stimulating a geothermal well was successfully conducted in December 1981 with a process called GEOFRAC. The 260°C well was located at the Union Oil Company's Geysers Field in northern California. For the initial test, 364 kg of a new explosive called HITEX II was placed at a depth of 2256 meters and detonated to verify techniques. The explosive was contained in an aluminum canister to separate it from the well fluids. In the second test, 5000 kg of explosive was used representing a column length of approximately 191 meters. The explosive was detonated at a depth of 1697 meters in the same well. The results of these tests show that HITEX II can be safely emplaced and successfully detonated in a hot geothermal well without causing damage to the well bore or casing.

59453 **(SAND—82-0261C) Geothermal drilling problems and their impact on cost.** Carson, C.C. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 18p. (CONF-820834—3). NTIS, PC A02/MF A01. Order Number DE82020626.

From 3. AAPG circum-Pacific Energy and Materials conference; Honolulu, HI, USA (22 Aug 1982).

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Historical data are presented that demonstrate the significance of unexpected problems. In extreme cases, trouble costs are the largest component of well costs or severe troubles can lead to abandonment of a hole. Drilling experiences from US geothermal areas are used to analyze the frequency and severity of various problems. In addition, average trouble costs are estimated based on this analysis and the relationship between trouble and depth is discussed. The most frequent drilling and completion problem in geothermal wells is lost circulation. This is especially true for resources in underpressured, fractured formations. Serious loss of circulation can occur during drilling - because of this, the producing portions of many wells are drilled with air or aerated drilling fluid and the resulting corrosion/erosion problems are tolerated - but it can also affect the cementing of well casing. Problems in bonding the casing to the formation result from many other causes as well, and are common in geothermal wells. Good bonds are essential because of the possibility of casing collapse due to thermal cycling during the life of the well. Several other problems are identified and their impacts are quantified and discussed.

59454 **(SAND—82-1374C) Impact of common problems in geothermal drilling and completion.** Carson, C.C.; Lin, Y.T. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-821007—10). NTIS, PC A02/MF A01. Order Number DE82016701.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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Problems that arise in geothermal drilling and completion account for a significant portion of geothermal well costs. In order to evaluate new technologies for combatting these problems, the relative frequencies and severities of different problems have been estimated. The estimates were based on both subjective judgements and analysis of available drilling records. The most common problems include lost circulation, stuck pipe and cementing, and their impact is to increase well cost by an average of at least 15%.

59455 **(SAND—82-1404C) Design of a diesel exhaust-gas purification system for inert-gas drilling.** Caskey, B.C. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-821007—3). NTIS, PC A02/MF A01. Order Number DE82017071.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

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To combat the serious oxygen corrosion of drill pipe when a low density drilling fluid (air or mist) is used in geothermal drilling, a system has been designed that produces an inert gas (essentially nitrogen) to be substituted for air. The system fits on three flatbed trailers, is roadable and produces 2000 scfm of gas. The projected cost for gas is slightly less than $2.00 per thousand standard cubic feet.

59456 **(SAND—82-1435C) Geothermal completion technology life-cycle cost model (GEOCOM).** Mansure, A.J.; Carson, C.C. (Sandia National Labs., Albuquerque, NM (USA); BDM Corp., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-821007—2). NTIS, PC A02/MF A01. Order Number DE82016787.

From Annual goethermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

GEOCOM is a model developed to evaluate the cost effectiveness of alternative technologies used in the completion, production, and maintenance of geothermal wells. The model calculates the ratio of life-cycle cost to life-cycle production or injection and thus is appropriate for evaluating the cost effectiveness of a geothermal well even when the most economically profitable well completion strategies do not result in lowest capital costs. The project to develop the GEOCOM model included the establishment of a data base for studying geothermal completions and preliminary case/sensitivity studies. The code has the data base built into its structure as default parameters. These parameters include geothermal resource characteristics; costs of geothermal wells, workovers, and equipment; and other data. The GEOCOM model has been written in ANSI (American National Standard Institute) FORTRAN 1966 version.

1510 Direct Energy Utilization

REFER ALSO TO CITATION(S) 59439, 59440, 59441

17 WIND ENERGY

1701 Availability (climatology)

59457 **(PNL—3870) Coastal-wind assessment: interviews and observations.** Wagner, N.K.; Meyers, C.E. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 60p. NTIS, PC A04/MF A01. Order Number DE82021376.

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The climatological data base for much of the immediate coastal sections of the United States is very limited. In many regions, especially along the coast of the Gulf of Mexico, most National Weather Service observing stations are located several miles inland. In an effort to better delineate wind characteristics in this data-sparse coastal environment, a pilot project that involved interviewing charter boat captains and commercial fishermen was initiated in the spring of 1978. At the same time, additional wind instruments were deployed in the study area, which includes Corpus Christi and Port Aransas, Texas, and the adjacent bays, inland waters, and the Gulf of Mexico. These interviews are summarized and the interview results are compared with the data. In addition, the interview methodology, interviewing forms and techniques are described. The interview process is judged to have excellent potential for use in the early phase of siting wind energy conversion systems. Some interview subjects were able to relate a remarkable amount of detail concerning wind distribution and variability.

1706 Wind Energy Engineering

59458 **(RFP—3387) Catalog of low-Reynolds-number airfoil data for wind-turbine applications.** Miley, S.J. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant; Texas A and M Univ., College Station (USA). Dept. of Aerospace Engineering). Feb 1982. Contract AC04-76DP03533. 591p. NTIS, PC A25/MF A01. Order Number DE82021712.

A literature survey was performed to acquire airfoil data at low Reynolds numbers which would be applicable to small wind energy conversion systems. The data were screened and the most reliable compiled into a catalog. Each entry includes airfoil coordinates, lift, drag and pitching moment characteristics in both graphical and tabular form. A discussion in elementary terms is given concerning airfoil behavior and the effects of Reynolds number, surface roughness and turbulence.

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 59110, 59614, 59620, 59625, 59658, 59961, 60189

59459 **(CONF-820814—24) Alkali-metal Rankine topping-cycle system design and development.** Holcomb, R.S. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 20p. NTIS, PC A02/MF A01. Order Number DE82020820.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

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The alkali metal vapor topping cycle with a steam cycle offers the potential of achieving a higher cycle efficiency than the steam cycle alone. An efficiency of about 50% is predicted for a cycle which employs either potassium or cesium with a vapor temperature at 1540°F (837°C) at the turbine inlet in a binary cycle where the metal vapor cycle is superimposed on a conventional steam cycle. A considerable amount of design and development work has been done by the Oak Ridge National Laboratory and other organizations on the alkali metal vapor Rankine cycle over the past several years. This effort was directed toward power systems for two applications: nuclear auxiliary power systems for space vehicles and central station electric generating plants. A potassium Rankine cycle nuclear space power system was designed and about 25,000 h of development testing was done on system components, including the boiler, turbine, pump and condenser. No component failures or problems nor materials problems were encountered during the course of the testing. Preliminary design studies have been carried out for central station electric power plants of 200 to 600 MW(e) output for potassium and cesium vapor topping cycles with both natural gas and fluidized bed coal firing. A full-scale potassium boiler tube bundle module of the gas-fired plant design was tested at 1540°F with gas firing. The potassium boiler performed very well and no boiler leaks were encountered. A leak occurred in a weld at a tee in the liquid return line from the condenser, but this problem was solved by installing a thermal sleeve in the tee to avoid thermal cycling of the metal from liquid temperature variations. The alkali metal vapor power system designs are described and the results of the testing and status of the technology are presented in the paper.

59460 **(CW-WR—76-020.77A) High-temperature-turbine-technology program. Phase II. Technology test and support studies. Topical report. Turbine spool technology rig design, fabrication & initial test.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Dec 1981. Contract AC01-76ET10348. 278p. (FE—2291-77A). NTIS, PC A13/MF A01. Order Number DE82020280.

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This report presents the work performed during the period from 1 August 1977 through 31 December 1980 to design, fabricate and test in full scale a new single-stage, high work transpiration air-cooled turbine. The turbine component was conceived and designed as the HP turbine of a two-spool, 17:1 pressure ratio gas turbine capable of operating at 3000°F inlet temperature. The rotating test vehicle for the new turbine component was a modification of an existing CW6515 engine designated the Turbine Spool Technology Rig (TSTR). Extensive design modifications were made to the basic CW6515 engine. These include, in addition to the new turbine component, a completely new high heat release combustor for operation on distillate fuel, provision for controlled variable bleed of up to 20% of compressor air, turbine component cooling air extraction at the compressor exit, a completely new exhaust section and structural changes to support the new turbine. Prior to operating the TSTR, component test programs were conducted on a 60° sector of the new annular combustor and a 10-vane cascade to determine characteristics of these components and to develop changes as required to assure satisfactory operation of the TSTR. Subsequent operation of the TSTR as a gas generator was accomplished with no significant problems. The mechanical integrity of a new transpiration air-cooled turbine component and the aerothermal capability of the high temperature turbine blading were demonstrated at turbine inlet temperatures up to 2650°F. In addition, the performance characteristics of the new turbine component were established. A turbine efficiency of 85% was indicated. Starting characteristics as well as compressor-turbine thrust balance features were determined and found to compare favorably with predictions. All testing was conducted using clean distillate fuel.

59461 **(CW-WR—76-020.98A) High-temperature-turbine-technology program. Phase II. Technology test and support studies. Topical report. Turbine Spool Technology Rig Fuel-Contaminant Tolerance Test.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Feb 1982. Contract AC01-76ET10348. 105p. (FE—2291-98A). NTIS, PC A06/MF A01. Order Number DE82020287.

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The TSTR test program was conducted principally to investigate the durability of high temperature transpiration air-cooled turbine blading under increasingly severe conditions simulating the combustion of coal-derived fuel. The TSTR was operated for over 100 h. Of this time, 75 hours were at design speed (8600 rpm corrected to standard day conditions) and turbine inlet temperature at or above 2600°F, with fly ash particulates in the hot gas stream at a loading of (or equivalent to) 20 to 23 wppM in the distillate fuel supply. Maximum particulate size was 5 microns. The test equipment, procedures and results are described. The high pressure ratio and mass flow of the TSTR produced turbine section particulate loading about twice that of the previously-tested LP rig engine. The test results showing durability of this new transpiration air-cooled blading to be comparable to that of the LP rig engine are extremely encouraging. Additional testing of the TSTR with contaminants is recommended to reduce further the uncertainties associated with extrapolation of these data to commercial gas turbine engine operating conditions. (LCL)

59462 **(DOE/FE/53179—01) Survey of oil-fired utility boilers: potential for coal-oil mixture conversion.** Jamgochian, E.M.; Foo, O.K.; Skinner, T.F. (Mitre Corp., McLean, VA (USA). METREK Div.). Jul 1980. Contract AC01-78CS53179. 85p. NTIS, PC A05/MF A01. Order Number DE82021808.

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This report has evaluated the significant factors pertaining to existing utility boilers which are currently burning fuel oil, and has analyzed the potential for conversion to COM technology. Detailed statistics for all utility boilers in the United States which are currently oil-fired have been compiled from published data and files. Critical boiler features and system characteristics are tabulated on a unit-by-unit basis. Distributions of age, size, location, and attainment status are included, along with a discussion of boiler types and designs. Other data relevant to fuel conversion are detailed, such as fuel consumption, capacity factor, and applicable state and federal energy and environmental standards.

59463 **(DOE/NASA/10350—31) Gas-turbine critical research and advanced technology (CRT) support project. FY 1980 annual report.** Furman, E.R.; Anderson, D.N.; Gedwill, M.A. Jr.; Lowell, C.E.; Schultz, D.F. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Jul 1982. Contract AI01-77ET10350. 46p. (NASA-TM—82872). NTIS, PC A03/MF A01. Order Number DE82022040.

This report summarizes the technical progress made during FY 1980 to provide a critical technology base for utility gas turbine systems capable of burning coal-derived fuels. Project tasks include the following: combustion - to investigate the combustion of coal-derived fuels and the conversion of fuel-bound nitrogen to NOx; materials - to understand and prevent the hot corrosion of turbine hot section materials; and system studies - to integrate and guide the technological efforts. Technical accomplishments during this fiscal period include: an extension of flame tube combustion testing of propane - Toluene Fuel Mixtures to vary H_2 content from 9 to 18%-wt and the comparison of results with that predicted from a NASA Lewis General Chemical Kinetics Computer Code; the design and fabrication of combustor sector test section to test current and advanced combustor concepts; Testing of Catalytic combustors with residual and coal-derived liquid fuels; testing of high strength super alloys to evaluate their resistance to potential fuel impurities using doped clean fuels and coal-derived liquids; and the testing and evaluation of thermal barrier coatings and bond coatings on conventional turbine materials.

59464 **(PNL—3688) Procedure for developing biological input for the design, location, or modification of water-intake structures.** Neitzel, D.A.; McKenzie, D.H. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1981. Contract AC06-76RL01830. 88p. (FWS/OBS—82/13.1). NTIS, PC A05/MF A01. Order Number DE82020946.

To minimize adverse impact on aquatic ecosystems resulting from the operation of water intake structures, design engineers must have relevant information on the behavior, physiology and ecology of local fish and shellfish. Identification of stimulus/response relationships and the environmental factors that influence them is the first step in incorporating biological information in the design, location or modification of water intake structures. A procedure is presented in this document for providing biological input to engineers who are designing, locating or modifying a water intake structure. The authors discuss sources of stimuli at water intakes, historical approaches in assessing potential/actual impact and review biological information needed for intake design.

59465 **(PNL—4088) Evaluation of models for developing biological input for the design and location of water-intake structures.** Simmons, M.A.; McKenzie, D.H. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1981. Contract AC06-76RL01830. 32p. (FWS/OBS—82/13.2). NTIS, PC A03/MF A01. Order Number DE82020943.

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An approach for assessing multiple stimulus/response relations between fish and water intake structures is presented in this report. The approach stresses stimulus/response relations influencing fish and shellfish distribution and is made up of two methods. The first places emphasis on spatial and temperal distributions of populations; information is presented in the form of a non-predictive model, which allows for organizing information and documenting review processes. The second approach encompasses functional relationships between environmental and biological stimuli and responses of organisms. By using the two methods together, functional relationships can be evaluated to define the distribution of a fish or shellfish species. This information can then be used to resolve questions relating to impingement and entrainment.

59466 **(PNL—4133) Guidance manual for the input of biological information to water-intake-structure design.** Neitzel, D.A.; Simmons, M.A.; McKenzie, D.H. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1981. Contract AC06-76RL01830. 44p. (FWS/OBS—82/13.3). NTIS, PC A03/MF A01. Order Number DE82020953.

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This manual is intended to provide guidance to the biologist who is asked to provide biological input during the construction or subsequent alteration of a water intake structure. Examples of the types of biological information that might be included in intake design are presented. Procedures for quantifying biological information and defining specific tasks that will generate quantifiable data are discussed. Procedures described apply both to new and modified water intake structures.

2002 Environmental Aspects

REFER ALSO TO CITATION(S) 59135, 59137, 59464, 59465, 59466, 59959, 60189, 60197, 60284

59467 **(DOE/MC/16472—78/3) Particle trajectories in a lattice of parallel magnetized fibers.** Simons, W.H.; Treat, R.P. (West Virginia Univ., Morgantown (USA); Department of Energy, Morgantown, WV (USA). Morgantown Energy Research Center). Mar 1978. Contract AT21-81MC16472. 80p. (MERC—78/3). NTIS, PC A05/MF A01. Order Number DE82020557.

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Trajectories of paramagnetic particles in regular infinite rectangular and rhombic lattices of parallel magnetized fibers have been calculated. The mathematical model for this analysis accounts for both the collective magnetic and the collective fluid effects of all the fibers in the lattice in the potential flow regime. The viscous force on the particles is taken to be the Stokes force, and diffusion and particle inertia are assumed to be negligible. The particle capture cross section for a fiber in a lattice is found to be significantly different from the isolated fiber cross section for closely packed fibers. However, they become equal as the filter porosity approaches unity. It is seen that channels form, allowing particles to pass through the filter. These channels persist for arbitrarily large porosity, but can be made as narrow as desired by increasing the ratio of magnetic to viscous forces.

59468 **(LA—9423-MS) Two-dimensional, two-phase numerical model for spray dryers.** O'Rourke, P.J.; Wadt, W.R. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 117p. NTIS, PC A06/MF A01. Order Number DE82021847.

This is the final report of a program to develop a detailed numerical model to simulate the desulfurization by spray dryers of the flue gases from coal fired power plants. The goals of this research were to supply a powerful analysis tool, a computer code called LDEF-SS, that permits the investigation of different spray dryer design concepts and operating conditions and hence provides a theoretical basis for optimizing performance and scaling up spray dryers. The bulk of this report is documentation for the LDEF-SS code. We also report the findings of an investigation we performed of the SO_2 absorption process. Due to funding limitations, we were unable to include the calculation of SO_2 absorption in the computer code. Nevertheless, the present version of LDEF-SS is a basis from which one can develop detailed models of flue gas desulfurization and many other industrial processes that use spray dryers.

2003 Power Transmission And Distribution

59469 (CONF-820866—1) Spark decomposition studies of dielectric gas mixtures. Sauers, I.; Christophorou, L.G. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE82020911.

From 7. international conference on gas discharges and their applications; London, UK (31 Aug 1982).

Portions of document are illegible.

The ultimate usefulness of a high voltage insulating gas will depend not only on the ability of the gas to withstand high voltages, but also on the degradation of the gas resulting from spark discharges, corona or prolonged electrical stress and the effect(s) of the by-products on the equipment and, possibly, the environment. In view of these considerations, we have undertaken in our laboratory the study of long-range spark decomposition in an effort to improve the decomposition characteristics of dielectric gases through proper tailoring of gas mixtures while maintaining high breakdown strengths. The data reported are on the analyses of gases sparked by capacitive (0.1 μF) discharge into a 0.5-mm gap, resulting in an energy input of $\sim$ 5 J per spark. The nature of the decomposition products of SF_6 formed by high voltage discharges observed is found to be critically dependent on impurities (particularly H_2O), electrode material and insulating materials present in the system. Each of these aspects is discussed.

59470 (EPRI-EL—1970-Vol.3) Research to develop guidelines for cathodic protection of concentric neutral cables. Volume 3. Final report. Hanck, J.A.; Nekoksa, G. (Pacific Gas and Electric Co., San Ramon, CA (USA)). Aug 1982. 251p. NTIS, PC A12/MF A01. Order Number DE82906480.

The objectives of this report were to determine and statistically analyze data associated with the corrosion of concentric neutral (CN) wires of direct-buried primary cables, and develop guidelines for cathodic protection of CN wires for the electric utility industry. This final report includes the cathodic protection guidelines. The guidelines for the installation of cathodic protection systems for CN cables are based upon the evaluation of over 100 experimental cathodic protection systems and upon laboratory testing for protection criteria with and without ac effects. The interim report, published in August 1981 (EL-1970, volumes 1 and 2), includes descriptions and results of field testing conducted at 36 bellholes excavated in California, Oklahoma, and North Carolina. It also includes details of the electrochemical, chemical, bacteriological, and sieve analyses of native soil and imported backfill samples.

59471 (EPRI-EL—2583-Vol.1) HVDC-AC system interaction from AC harmonics. Volume 1. Harmonic impedance calculations. Final report. Breuer, G.D.; Chow, J.H.; Lindh, C.B.; Miller, N.W.; Numrich, F.H.; Price, W.W.; Turner, A.E.; Whitney, R.R. (General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.). Sep 1982. 345p. NTIS, PC A15/MF A01. Order Number DE82021015.

Portions of document are illegible.

Improved methods are needed to characterize ac system harmonic behavior for ac filter design for HVDC systems. The purpose of this General Electric Company RP1138 research is to evaluate the present filter design practice and to investigate methods for calculating system harmonic impedances. An overview of ac filter design for HVDC systems and a survey of literature related to filter design have been performed. Two methods for calculating system harmonic impedances have been investigated. In the measurement method, an instrumentation system for measuring system voltage and current has been assembled. Different schemes of using the measurements to calculate system harmonic impedances have been studied. In the analytical method, a procedure to include various operating conditions has been proposed. Computer programs for both methods have been prepared, and the results of the measurement and analytical methods analyzed. A conclusion of the project is that the measurement and analytical methods both provided reasonable results. There are correlations between the measured and analytical results for most harmonics, although there are discrepancies between the assumptions used in the two methods. A sensitivity approach has been proposed to further correlate the results. From the results of the analysis, it is recommended that both methods should be tested further. For the measurement method, more testing should be done to cover different system operating conditions. In the analytical method, more detailed models for representing system components should be studied. In addition, alternative statistical and sensitivity approaches should be attempted.

59472 (EPRI-EL—2583-Vol.2) HVDC-AC system interaction from ac harmonics. Volume 2. Computer-program documentation. Final report. Breuer, G.D.; Chow, J.H.; Lindh, C.B.; Miller, N.W.; Numrich, F.H.; Price, W.W.; Turner, A.E.; Whitney, R.R. (General Electric Co., Schenectady, NY (USA). Electric Utility Systems Engineering Dept.). Sep 1982. 149p. NTIS, PC A07/MF A01. Order Number DE82020969.

Portions of document are illegible.

Improved methods are needed to characterize ac system harmonic behavior for ac filter design for HVDC systems. The purpose of this General Electric Company RP1138 research is to evaluate the present filter design practice and to investigate methods for calculating system harmonic impedances. An overview of ac filter design for HVDC systems and a survey of literature related to filter design have been performed. Two methods for calculating system harmonic impedances have been investigated. In the measurement method, an instrumentation system for measuring system voltage and current has been assembled. Different schemes of using the measurements to calculate system harmonic impedances have been studied. In the analytical method, a procedure to include various operating conditions has been proposed. Computer programs for both methods have been prepared, and the results of the measurement and analytical methods analyzed. This volume documents the computer programs. A conclusion of the project is that the measurement and analytical methods both provided reasonable results. There are correlations between the measured and analytical results for most harmonics, although there are discrepancies between the assumptions used in the two methods. A sensitivity approach has been proposed to further correlate the results. From the results of the analysis, it is recommended that both methods should be tested further. For the measurement method, more testing should be done to cover different system operating conditions. In the analytical method, more detailed models for representing system components should be studied. In addition, alternative statistical and sensitivity approaches should be attempted.

59473 (GAT/GDP—1100) Investigation of Auxiliary Power Substation 95A4 fault and fire, Portsmouth Gaseous Diffusion Plant, March 24, 1982. (Goodyear Atomic Corp., Piketon, OH (USA)). Jun 1982. Contract AC05-76OR00001. 63p. NTIS, PC A04/MF A01. Order Number DE82020074.

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On March 24, 1982, an electrical fault and resultant fire in the 480 volt Auxiliary Power Substation 95A4 at the Portsmouth Gaseous Diffusion Plant destroyed that substation. There were no personal injuries, the overall loss was limited to the Substation, and the cost of replacing the Substation with repaired and new components has been estimated at $184,000. At the time of the incident, Goodyear was involved in a project to replace the obsolete 480 volt circuit breaker of the Auxiliary Power System. This project involved the disassembly, refurishing, and reassembly of 480 volt circuit breaker carriages by Goodyear personnel. The fault occurred in a circuit breaker upgraded under this project. The investigation of this accident is reported. The evidence suggests the fault resulted from the improper assembly of an upgraded 480 volt circuit breaker. Compounding the problem and leading to the extensive damage was the failure of the transformer secondary breaker to trip open as designed and interrupt the flow of power to the substation. It is surmised that inadequate testing during preventive maintenance contributed to this condition. Additional factors which may have contributed to the accident included: no requirements for assuring the competence of the electricians who installed the circuit breakers, no specific assembly instructions to the electricians, inadequate procedure instructions, and an inadequate procedure governing operational or load testing of the breaker. (LCL)

59474 **(LA—9342-PR) Superconducting-transmission-line project at the Los Alamos National Laboratory: final report. Progress report, October 1, 1980-September 30, 1981.** Keller, W.E. (comp.). (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 38p. NTIS, PC A03/MF A01. Order Number DE82021835.

Results are presented of experiments aimed at developing advanced, high-capacity, power transmission conductors using superconducting materials derived from Nb_3Ge. Successful efforts for producing a model superconducting (Nb_3Sn) joint for use in superconducting lines are described. Realistic theoretical calculations have been completed on the cooldown of a model ac transmission line designed by the Brookhaven National Laboratory program.

59475 **(UCID—19120-Rev.1) Technical-evaluation report on the adequacy of station electric-distribution-system voltages for the San Onofre Nuclear Generating Station, Unit 1. Document No. 50-206.** Selan, J.C. (Lawrence Livermore National Lab., CA (USA)). 8 Sep 1982. Contract W-7405-ENG-48. 11p. NTIS, PC A02/MF A01. Order Number DE82021546.

This report documents the technical evaluation of the adequacy of the station electric distribution system voltages for the San Onofre Nuclear Generating Station, Unit 1. The evaluation is to determine if the onsite distribution system in conjunction with the offsite power sources has sufficient capacity to automatically start and operate all Class 1E loads within the equipment voltage ratings under certain conditions established by the Nuclear Regulatory Commission. The analysis submitted demonstrates that acceptable voltages will be supplied to the Class 1E equipment under worst-case conditions.

59476 **(UCID—19459) Technical-evaluation report on the adequacy of station electric-distribution-system voltages for the Vermont Yankee Nuclear Power Station. Document No. 50-271.** Selan, J.C. (Lawrence Livermore National Lab., CA (USA)). 3 Sep 1982. Contract W-7405-ENG-48. 11p. NTIS, PC A02/MF A01. Order Number DE82021547.

This report documents the technical evaluation of the adequacy of the station electric distribution system voltages for the Vermont Yankee Nuclear Power Station. The evaluation is to determine if the onsite distribution system, in conjunction with the offsite power sources, has sufficient capacity to automatically start and operate all Class 1E loads within the equipment voltage ratings under certain conditions established by the Nuclear Regulatory Commission. The evaluation finds that the voltage analyses submitted demonstrate that adequate voltage will be supplied to the Class 1E equipment under worst case conditions.

59477 **(UCRL—87605) Method of utility-system source-impedance measurement for the industrial power engineer.** Corvin, W.C. (Lawrence Livermore National Lab., CA (USA)). 24 May 1982. Contract W-7405-ENG-48. 4p. (CONF-821008—1). NTIS, PC A02/MF A01. Order Number DE82015758.

From IEEE annual meeting of the Industry Applications Society; San Francisco, CA, USA (4 Oct 1982).

Portions of document are illegible.

In general, the power company that delivers energy to an industrial power system will supply, upon request, information describing the utility source impedance at the point of interconnection with the industrial customer. this information is usually expressed as the maximum available short-circuit MVA (megavolt amperes) that the utility can deliver at some nominal voltage. For sizing the interrupting ratings of protective equipment, this number is important. However, better information is required for modeling the utility system under all conditions of system switching, generation, and loading. In this paper a method is described for measuring the utility source impedance that gives a more realistic representation of the utility at the point of interconnection. It is increasingly important that the industrial power engineer accurately view the power company as a power source of variable impedance. Industrial loads may operate and interact differently, depending on the relative stiffness of their power source. Electric utilities increasingly experience planned voltage reductions, brownouts, and temporary line-switching configurations that can leave the industrial customer with a power source far different from the one normally expected.

21 NUCLEAR POWER PLANTS

59478 **(BNL-NUREG—31733) Quantification of human performance through the use of nuclear-power-plant experience.** Hall, R.E. (Brookhaven National Lab., Upton, NY (USA)). Jun 1982. Contract AC02-76CH00016. 8p. (CONF-820656—4). NTIS, PC A02/MF A01.

From Workshop on low-probability/high consequence risk analysis; Arlington, VA, USA (15 Jun 1982).

There is wide agreement throughout the commercial nuclear industry that there is a severe shortage of data on man-machine success or failure rates. At the same time, the need to adequately integrate human performance and system's analysis in the evaluation of nuclear power plant availability and safety is recognized as a dominant need. Therefore, if we are to successfully address the industry's current requirements, we must optimize the use of all existing data. This paper discusses the problem and suggests useful ways of utilizing available nuclear data and presents a conceptual format to better collect actuarial data on the most critical, from a safety perspective, aspects of the man-machine interface in a nuclear power plant.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 59476, 59525, 59563, 59582, 59583, 59590, 59594, 59595, 59601, 59602, 59603, 59605, 59608, 59609, 59611, 59612

59479 **(DOE/ET/34215—30) Fuel performance improvement program. Semiannual progress report, October 1981-March 1982.** Woods, K.N.; Barner, J.O. (Pacific Northwest Lab., Richland, WA (USA); Exxon Nuclear Co., Inc., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 40p. (PNL—4352). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82021749.

Progress under the Fuel Performance Improvement Program (FPIP) is reported for the semiannual period of October 1981 - March 1982. The objectives of the FPIP are to develop commercially viable LWR fuel designs which are highly resistant to pellet-cladding interaction (PCI) failures and to demonstrate the satisfactory irradiation performance of the selected designs. During this period, documentation describing steady-state irradiation tests that were completed in the Halden Boiling Water Reactor (HBWR) was continued. Topical reports were issued for the IFA 518.1 and IFA 517.1 steady-state irradiation tests, and a topical report was in preparation for the IFA 518.2 steady-state irradiatin tests. The key observations and conclusions from these three topical reports are summarized in this semiannual report. Data analysis and evaluation of ramping tests performed in the HBWR and the postirradiation examinations (PIE) being performed at AERE-Harwell continued during the reporting period. The irradiation status of FPIP demonstration fuel rods in the Big Rock Point Reactor (BRPR) is described. A preliminary plan for power-ramping 16 to 20 fuel rod segments from BRPR in the R-2 Test Reactor in Studsvik, Sweden is also presented.

59480 (INIS-mf—7042, pp v) **NPE information system.** Stefanik, J. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice (Czechoslovakia)). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The Nuclear Power Experience system (NPE) contains information on all nuclear power plants equipped with light water reactors in the US and available information on certain nuclear power plants in other countries. It mainly contains information on various failures and break-downs of these units and the manner in which they have been remedied. The structure of the NPE and the scope of its parts are described.

59481 **(INIS-mf—7061) Capital costs of light water reactors: the USA.** MacKerron, G. (Sussex Univ., Brighton (UK). Science Policy Research Unit). (Surtsey Research Society, Reykjavik (Iceland)). Oct 1979. 58p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780689.

The cost of building a modern nuclear power plant is greater than that of almost any other single civilian project - costs of individual plants are reckoned in hundreds of millions of pounds in the UK, and up to a billion dollars or more in the USA. Hence, depending on the size of nuclear programmes and their funding, escalation of nuclear capital costs may have important economic and social consequences through its effects on overall resource allocation. It is therefore important to analyse the extent and, as far as possible, the sources of cost increases and escalation, in order to see if the experience yields implications for technology policy. The USA has much the greatest experience in nuclear construction: it also has by far the largest amount of published information on the subject of capital costs. As all other countries lack either sufficient experience and/or adequate published cost information, it is impossible to conduct a genuine international comparison, and this paper is confined to an examination of US experience. This paper therefore assembles and evaluates currently available data on light water reactor (PWR and BWR) capital costs in the USA.

59482 **(NUREG/CR—2585) Nuclear-power-plant damage-control measures and design changes for sabotage protection. Final report.** Lobner, P. (Science Applications, Inc., La Jolla, CA (USA)). May 1982. Contract AC04-76DP00789. 350p. (SAND—82-7011). NTIS, PC A15/MF A01 - GPO.

Portions of document are illegible.

This report documents the engineering evaluation of twenty-seven proposed damage control measures and associated system-level design changes that could be of potential benefit in providing protection against sabotage at commercial light water reactor (LWR) power plants. The damage control measures emphasize the use of existing systems in normal or alternate modes of operation. The proposed system-level design changes are those necessary to support the use of existing systems in alternate modes. To the extent practical, the system-level design changes have been limited in scope to those that could be retrofitted in existing nuclear power plants. The potential applicability of each damage control measure and system-level design change is defined, and the impact of its implementation is subjectively estimated. Damage control measures and design changes are not stand-alone measures for providing protection against sabotage. However, the potential role of damage control and design change in an integrated sabotage protection system is discussed in this report.

59483 **(SAND—82-0451C) Containment-emergency-sump studies to investigate Unresolved Safety Issue A-43.** Weigand, G.G.; Krein, M.S.; Wester, M.J.; Padmanabhan, M. (Sandia National Labs., Albuquerque, NM (USA); Worcester Polytechnic Inst., Holden, MA (USA). Alden Research Lab.). 1982. Contract AC04-76DP00789. 10p. (CONF-820802—15). NTIS, PC A02/MF A01. Order Number DE82020821.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

A systematically structured test program designed to characterize the hydraulic behavior of full-scale emergency core cooling system (ECCS) sumps under a broad range of geometric configurations and flow conditions has been conducted. The effects of potential accident induced perturbations on sump performance were also evaluated. These perturbations included screen blockage, nonuniform approach flows, break flow and ice condenser drain flow impingement, and obstructions. In addition, the effects of elevated water temperature and the performance of vortex suppression devices have been established. The results show that the vortices are unstable and that vortex size and type is not a reliable indicator to adjudge air ingestion or swirl behavior. Measured air withdrawal rates were generally less than 1 to 2% and the measured swirl in the outlet pipes was small. An envelope curve analysis of the data was developed, and it gives the bounded performance response of the sump as a function of the flow variables. These results are being used to develop comprehensive design and review guidelines for ECCS sumps. Additionally, the test results will be used in developing the resolution of Unresolved Safety Issue A-43, Containment Emergency Sump Performance.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 59333, 59475, 59479, 59480, 59481, 59482, 59483, 59525, 59527, 59534, 59565, 59568, 59569, 59577, 59579, 59580, 59581, 59582, 59589, 59592, 59593, 59594, 59596, 59598, 59600, 59604, 59605, 59607, 59608, 59609, 59610, 59611, 59612

59484 **(CEA-CONF—5887) Identification of nuclear plant temperatures. Feedback parameters using experimental data.** Abdel Hamid, S. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Electronique et d'Instrumentation Nucleaire). Sep 1981. 6p. (CONF-8108130—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702393.

From Symposium IASTED; Cairo, Egypt (31 Apr 1981).

This work is concerned with the identification of the fuel and moderator reactivity feedback coefficients of a Pressurized Water Reactor (PWR) using actual measurements. The main aim of this study is to examine the possibility to use a simplified model representing the reactor dynamics, which can be simulated on minicomputer and to supply an identification algorithm to get the feedback coefficients of PWR. The theoretical model of a PWR is built from the space independent reactor kinetics equation associated with six delayed neutron groups equations, as well as twelve equations describe the heat balance for the fuel and the moderator inside the reactor core, assuming that the core is composed from six successive axial zones. The reactor is externally perturbed by moving its control rods, and the corresponding changes in power and temperatures are recorded. The mathematical model has been solved numerically using fifth order Runge-Kutta integration technique by special developed package using Solar 16-40 computer (64 K memory size). As an identification algorithm, the Nelder-Mead Simplex method has been used to minimize the sum of the squares of the differences between measured and calculated reactor power. Hence, the feedback coefficients have been identified from off-line calculations.

59485 **(EPRI-NP—2269) Metallurgical investigation of disc cracking in the LP-2 turbine at a nuclear power station. Final report.** Burghard, H.C. (Southwest Research Inst., San Antonio, TX (USA)). Jul 1982. 128p. NTIS, PC A07/MF A01. Order Number DE82906428.

An investigation of combined face cracking and rim cracking in discs of an LP steam turbine rotor was performed. The incident in question involved the development of major cracks in the hub/web transition on the outlet face of the disc as well as major cracking of the blade attachment steeples. Both types of cracking occurred in the No. 1 discs at both ends of a particular rotor. The program was based on a metallurgical evaluation of hub and rim samples of discs removed from the turbine rotor after approximately 31,000 hours of operation. In-depth metallographic and fractographic examinations of representative face cracks and rim cracks were conducted. In addition, the mechanical properties and chemical composition of each of the disc samples were determined. Analyses of crack surface deposits and bulk turbine deposits were also performed.

59486 **(EPRI-NP—2531) Intergranular stress-corrosion cracking of austenitic stainless steels in PWR boric-acid storage systems.** Macdonald, D.D.; Cragnolino, G.A.; Olemacher, J.; Chen, T.Y.; Dhawale, S. (Ohio State Univ., Columbus (USA). Dept. of Metallurgical Engineering). Aug 1982. 162p. NTIS, PC A08/MF A01. Order Number DE82906465.

A review is presented of the available literature on the intergranular stress corrosion cracking (IGSCC) of austenitic stainless steels at temperatures below 100°C, as well as the results of an experimental investigation of the IGSCC of Types 304, 304L, and 316L stainless steels conducted in boric acid environments of the type employed in pressurized nuclear reactors (PWRs) for nuclear shim control. The susceptibility of furnace sensitized Type 304SS to

IGSCC was studied using slow strain rate tests as a function of pH, temperature, potential, and concentration of suspected contaminants: chloride, thiosulfate, and tetrathionate. Possible alternate alloys, such as Types 304L and 316L stainless steels, were also tested under those specific conditions that render Type 304SS susceptible to cracking. Corrosion potentials that can be attained in air-saturated boric acid solutions in the presence of the above mentioned species were measured in order to evaluate the propensity towards intergranular cracking under conditions simulating those that prevail in service.

59487 **(EPRI-NP—2564-SY) Electric-generator monitoring and diagnostics. Final report.** Emery, F.T.; Gottlieb, M.; Brandt, G.B. (Westinghouse Electric Corp., East Pittsburgh, PA (USA). Steam Turbine Generator Div.). Aug 1982. 37p. NTIS, PC A03/MF A01. Order Number DE82906463.

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The purpose of EPRI Research Project 970 is to improve turbine-generator availability by developing on-line monitoring instrumentation capable of early detection of developing malfunctions. This is the second report for this project and it presents a summary of the development work on an on-line rf monitor and a fiber optic temperature sensor. The rf monitor detects internal generator arcing and alerts the operator if the arcing level becomes destructively high. The fiber optic temperature sensor detects hot spots in generator stator windings, in a high voltage and high electromagnetic flux environment.

59488 **(GEND-INF—022) Status of TMI-2 instruments and electrical components.** Helbert, H.J. (EG and G Idaho, Inc., Idaho Falls (USA)). Aug 1982. Contract AC07-76ID01570. 17p. NTIS, PC A02/MF A01. Order Number DE82021877.

In the Task 1.0 section of the GEND 001 Planning Report, the Instrumentation and Electrical Equipment Survivability Planning Group (IEPG) supplied planning, guidance, and recommendations on collecting survivability data on instruments and electrical equipment involved in the March 28, 1979, accident at the Three Mile Island Unit 2 (TMI-2) Reactor. GEND 001 recommended collection of further data on the status of all the instruments and electrical equipment it listed. The current report supplies information concerning the operational status of instruments and electrical equipment listed in the Task 1.0 section of GEND 001. This document will be updated in the future as additional information is obtained.

59489 (INIS-mf—6937, pp vp) **Optimization of once-through uranium cycle for pressurized light water reactors.** Radkowsky, A. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59490 (INIS-SU—18, pp 139-146) **Calculation of heat and mass transfers and hydraulic processes in an operating channel of the WWER-type reactor in a stationary regime.** Pavlov, V.P.; Stoyanov, S.P. (NIPPIEhS Ehnergoproekt, Sofiya (Bulgaria)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 4. all union conference on heat-masstransfer; Minsk, Byelorussian, USSR (Sep 1980).

A method for calculating transfer processes in an operating channel of nuclear reactor considered as a multiphase multicomponent system is suggested. A concrete version of the operating channel of the WWER-440 type nuclear reactor is considered; results of calculation of typical parameters are given.

59491 **(Mon-P—93) High-pressure water as a heat-transfer medium in nuclear power plants.** Weinberg, A.M.; Murray, F.H. (Clinton Labs., Oak Ridge, TN (USA)). 10 Apr 1946. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE82021746.

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The design characteristics of thorium-fueled pressurized-water reactors are presented.

59492 **(NUREG/CR—1891) Reliability analysis of containment strength.** Greimann, L.; Fanous, F.; Sabri, A.; Ketelaar, D.; Wolde-Tinsae, A.; Bluhm, D. (Ames Lab., IA (USA)). Aug 1982. Contract W-7405-ENG-82. 265p. (IS—4753). NTIS, PC A12/MF A01 - GPO $7.50.

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The Sequoyah and McGuire ice condenser containment vessels were designed to withstand pressures in the range of 12 to 15 psi. Since pressures of the order of 28 psi were recorded during the Three Mile Island incident, a need exists to more accurately define the strength of these vessels. A best estimate and uncertainty assessment of the strength of the containments were performed by applying the second moment reliability method. Material and geometric properties were supplied by the plant owners. A uniform static internal pressure was assumed. Gross deformation was taken as the failure criterion. Both approximate and finite element analyses were performed on the axisymmetric containment structure and the penetrations. The predicted strength for the Sequoyah vessel is 60 psi with a standard deviation of 8 psi. For McGuire, the mean and standard deviations are 84 psi and 12 psi, respectively. In an Addendum, results by others are summarized and compared and a preliminary dynamic analysis is presented.

59493 **Cost impacts of fuel failures at the Connecticut Yankee Power Station.** Hills, M.P.; Pitek, M.T. (Northeast Utilities, P.O. Box 270, Hartford, CT 06101). *Transactions of the American Nuclear Society;* **41**: 115(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

2103 Power Reactors, Non-breeding, Graphite Moderated

59494 **(CONF-820806—3) Interaction of noble-metal fission products with pyrolytic silicon carbide.** Lauf, R.J.; Braski, D.N. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 2p. NTIS, PC A02/MF A01. Order Number DE82020929.

From 40. Electron Microscopy Society of America annual meeting; Washington, DC, USA (9 Aug 1982).

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Fuel particles for the High-Temperature Gas-Cooled Reactor (HTGR) contain layers of pyrolytic carbon and silicon carbide, which act as a miniature pressure vessel and form the primary fission product barrier. Of the many fission products formed during irradiation, the noble metals are of particular interest because they interact significantly with the SiC layer and their concentrations are somewhat higher in the low-enriched uranium fuels currently under consideration. To study fission product-SiC interactions, particles of UO_2 or UC_2 are doped with fission product elements before coating and are then held in a thermal gradient up to several thousand hours. Examination of the SiC coatings by TEM-AEM after annealing shows that silver behaves differently from the palladium group.

59495 **(CONF-820859—1) HTGR technology development: status and direction.** Kasten, P.R. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE82020811.

From Gas-cooled reactor associates utilities/users conference on the HTGR; San Diego, CA, USA (9 Aug 1982).

During the last two years there has been an extensive and comprehensive effort expended primarily by General Atomic (GA) in generating a revised technology development plan. Oak Ridge National Laboratory (ORNL) has assisted in this effort, primarily through its interactions over the past years in working together with GA in technology development, but also through detailed review of the initial versions of the technology development plan as prepared by GA. The plan covers Fuel Technology, Materials Technology (including metals, graphite, and ceramics), Plant Technology (including methods, safety, structures, systems, heat exchangers, control and electrical, and mechanical), and Component Design Verification and Support areas (including the PCRV, con-

trol, fuel handling, service equipment, reactor core and internals, cooling and service systems).

59496 **(EPRI-NP—2548) Assessment of effects of Fort St. Vrain HTGR primary coolant on Alloy 800. Final report.** Trester, P.W.; Johnson, W.R.; Simnad, M.T.; Burnette, R.D.; Roberts, D.I. (General Atomic Co., San Diego, CA (USA)). Aug 1982. 149p. NTIS, PC A07/MF A01. Order Number DE82906462.

A comprehensive review was conducted of primary helium coolant chemistry data, based on current and past operating histories of helium-cooled, high-temperature reactors (HTGRs), including the Fort St. Vrain (FSV) HTGR. A reference observed FSV reactor coolant environment was identified. Further, a slightly drier expected FSV coolant chemistry was predicted for reactor operation at 100% of full power. The expected environment was compared with helium test environments used in the US, United Kingdom, Germany, France, and Japan. Based on a comprehensive review and analysis of mechanical property data reported for Alloy 800 tested in controlled-impurity helium environments (and in air when appropriate for comparison), an assessment was made of the effect of FSV expected helium chemistry on material properties of alloy 800, with emphasis on design properties of the Alloy 800 material utilized in the FSV steam generators.

59497 **(GA-A—16764) Radiochemical analysis of the first plateout probe from the Fort St. Vrain high-temperature gas-cooled reactor.** Burnette, R.D. (General Atomic Co., San Diego, CA (USA)). Jun 1982. Contract AT03-76ET35300. 125p. NTIS, PC A06/MF A01. Order Number DE82021662.

This report presents the analysis of radioactive elements on the first plateout probe from the Fort St. Vrain high-temperature gas-cooled reactor. The plateout probe is a device which samples the primary coolant for condensible fission products. Circuit inventories of individual radionuclides are estimated from the probe analysis. The analysis shows that the radioactive contamination in the primary circuit is remarkable low, with activation product concentrations much greater than that of fission products. The analysis demonstrates that the concentrations of the key fission products I-131 and Sr-90 are far below the limits allowed by the technical specification.

59498 **(INIS-mf—7076) Liquid-metal-gas heat exchanger for HTGR type reactors.** Werth, G. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen). 16 Jun 1980. 163p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780683.

Thesis.

The aim of this study is to investigate the heat transfer characteristics of a liquid metal heat exchanger (HE) for a helium-cooled high temperature reactor. A tube-type heat exchanger is considered as well as two direct exchangers: a bubble-type heat exchanger and a heat exchanger according to the spray principle. Experiments are made in order to determine the gas content of bubble-type heat exchangers, the dependence of the droplet diameter on the nozzle diameter, the falling speed of the droplets, the velocity of the liquid jet, and the temperature variation of liquid jets. The computer codes developed for HE calculation are structured so that they may be used for gas/liquid HE, too. Each type of HE that is dealt with is designed by accousting for a technical and an economic assessment. The liquid-lead jet spray is preferred to all other types because of its small space occupied and its simple design. It shall be used in near future in the HTR by the name of lead/helium HE.

59499 (INIS-SU—86, pp 221-222) **Fundamentals of chemical technology of some systems and loops of nuclear power stations with the LWGR-1000 reactor.** Sedov, V.M.; Krutikov, P.G.; Konstantinov, E.A.; Zaika, V.I.; Loshkova, L.I.; Mednikov, A.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59500 **(ORNL/TM—8346) Comparison of US and FRG post-irradiation examination procedures to measure statistically significant failure fractions of irradiated coated-particle fuels.** Kania, M.J.; Homan, F.J.; Mehner, A.W. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 51p. NTIS, PC A04/MF A01. Order Number DE82021534.

Two methods for measuring failure fraction on irradiated coated-particle fuels have been developed, one in the United States (the IMGA system - Irradiated-Microsphere Gamma Analyzer) and one in the Federal Republic of Germany (FRG) (the PIAA procedure - Postirradiation Annealing and Beta Autoradiography). A comparison of the two methods on two standardized sets of irradiated particles was undertaken to evaluate the accuracy, operational procedures, and expense of each method in obtaining statistically significant results. From the comparison, the postirradiation examination method employing the IMGA system was found to be superior to the PIAA procedure for measuring statistically significant failure fractions. Both methods require that the irradiated fuel be in the form of loose particles, each requires extensive remote hot-cell facilities, and each is capable of physically separating failed particles from unfailed particles. Important differences noted in the comparison are described.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 59266, 59267, 59570, 59571, 59572, 59573, 59574, 59575, 59576, 59586, 59588, 59599, 59748

59501 **(CEA-CONF—5017) Design features affecting dynamic behaviour of fast reactor cores.** Kayser, G.; Gouriou, A. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Jun 1981. 33p. (CONF-8106230—1). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702356.

From Conference on core design features affecting dynamic behaviour; Rome, Italy (2 Jun 1981).

The study of dynamic response of an LMFBR to normal and accidental transients needs first of all a simulation code taking into account all the important effects. The DYN-1 code aims at this target. It represents with a sufficiently accurate meshing the core in a 20 geometry for the thermal and reactivity effects, while the kinetics of this core are calculated with a point model. The primary pool, secondary loops, steam generator are also represented, as well as the control and protective systems. We give a short description of this code. Simpler codes are sometimes good enough for parametric studies.

59502 **(CEA-CONF—5909) Plugging indicator measurement of low impurity concentrations at a constant orifice temperature.** Feron, D. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Mar 1981. 18p. (CONF-810369—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702388.

From International seminar on physical chemistry of liquid metals; Karlsruhe, F.R. Germany (24 Mar 1981).

It is often difficult to measure a plugging temperature when the impurity concentration in liquid sodium is low. Then, the plugging temperature is considered to be inferior to 110°C. Sometimes, a more precise indication is required. We propose a use for the plugging indicator which satisfies this type of requirement. A partial plugging of the indicator orifice is produced and increases at a constant temperature. A mathematical model describes this growth: it is based mainly on the kinetics of Na_2O and NaH crystal growth and links the plugging time to oxygen or hydrogen concentrations.

59503 **(CEA-CONF—5910) Comparison of finite differences and finite elements in the case of large fast power reactor.** Estiot, J.C.; Salvatores, M.; Honde, D.; Palmiotti, G. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Apr 1981. 35p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702396.

From International seminar on the role of finite element methods in radiation physics; London, UK (23 - 24 Apr 1981).

A large number of test calculations in two-dimension hexagonal geometry for different configurations of SUPER-PHENIX 1 type Fast Reactor have been performed to compare finite differences theory versus finite elements theory performances. At present, no definitive advantages were found for the application of the finite elements method to two dimensional hexagonal design calculations.

59504 **(CEA-CONF—5918) Sodium void reactivity effect in fast neutron critical facilities: uncertainties due to transposition to power reactors.** Lyon, F.; Rimpault, G.; Martini, M. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Jun 1981. 32p. (CONF-8106230—2). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702397.

From Conference on core design features affecting dynamic behaviour; Rome, Italy (2 Jun 1981).

The analysis of the sodium-void experiences performed in a clean core during the PRE-RACINE experiment, has given an important information on sodium-void reactivity effect calculation methods. The use of a "standard" method based on two dimensional diffusion calculations in R, Z geometry with 25 energy groups results in large discrepancies between calculated and experimental values, if an isotropic diffusion coefficient is utilized.

59505 **(CEA-CONF—5920) Acoustic detection of a cavitation noise in the French breeder reactor Phenix.** Brunet, M.; Desprets, A. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Jun 1981. 12p. (CONF-8106236—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702398.

From Specialists meeting on boiling noise detection; Risley, UK (9 Jun 1981).

The French Phenix reactor is provided with an in-core multi-sensor acoustic surveillance system. But its efficiency with regard to early boiling detection is still to be proven. For lack of boiling events within the core, a cavitating dummy steel subassembly has been loaded into the reactor, as a simulation of boiling signal. Cavitation is controlled through a slow rise of the primary flow in various core conditions: isothermal situation and during a rise of power. Assuming that the signal to noise ratio is of the same order of magnitude for cavitation signals as for boiling ones, the response of several signal processing techniques is evaluated. Pulse connecting seems to be the most efficient conventional method while pattern recognition appears as a promising alternative solution.

59506 **(CEA-CONF—6014) Dynamic behavior of hybrid sodium bearings. Theoretical and experimental studies.** Guidez, J.; Juignet, N.; Queval, M. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 15p. (CONF-810801—84). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702399.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The primary sodium pump shaft lower section of a fast breeder reactor is guided by a hydrostatic sodium bearing. This recess type bearing is supplied via orifices restrictors. Sodium is sampled at hight pressure at the diffuser outlet and is then centrifuged towards the orifices restrictors. Bearing stiffness and damping data is essential for the study of rotor dynamic behavior. Two points in particular may then be studied: - calculation of rotor instability ranges and critical speeds, - dynamic behavior of the rotor in the event of an earthquake. As regards the bearing design, the problem is to obtain the pressure fields in the liquid film. The integration of these pressure fields will then give the stiffness coefficients. The damping coefficients can then be obtained by the same calculation after slight displacement. The Reynolds equation can be used to study the liquid film (under any conditions for the turbulent and inertia effects). Then the computer code DELPAL is explained that solves the modified Reynolds equation using a finite element method. The presentation of tests conducted in 1981 on the Super-Phenix 1 full scall bearing (diameter 850 mm) in water is made. In conclusion this paper describes a method for calculating the stiffness and damping matrices of a hydrostatic bearing using the DELPAL calculation code and shows the loop of behavior tests on a bearing with sinusoidal excitation. The results, obtained by calculation and by testing, are indispensable when calculating the dynamic behavior of the shaft line.

59507 **(CEA-CONF—6015) Calculations of the LMFBR hexagonal wrapper tube deformations.** Ammann, P. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 12p. (CONF-810801—85). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702400.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

During its life time in a LMFBR core the hexagonal wrapper tube of the fuel subassembly is subjected to different loads due to: 1) Irradiation induced swelling and creep 2) thermal expansion 3) internal pressure 4) interaction forces between subassemblies 5) interaction forces between the fuel bundle and the tube 6) internal stresses accumulated during the manufacturing process. The computer program ARGORH calculates the deformation of the wrapper tube due to the first three loads. It also provides the creep matrix to the equilibrium program HARMONIE to study the influence of load 4.

59508 **(CEA-CONF—6021) First experimental validation on the core equilibrium code: HARMONIE.** Van Dorsselaere, J.; Cozzani, M.; Gnuffi, M. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 17p. (CONF-810801—90). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702405.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The code HARMONIE calculates the mechanical equilibrium of a fast reactor. An experimental program of deformation, in air, of groups of subassemblies, was performed on a mock-up, in the Super Phenix 1- geometry. This program included three kinds of tests, all performed without and then with grease: on groups of 2 or 3 rings of subassemblies, subjected to a force acting upon flats or angles; on groups of 35 and 41 subassemblies, subjected to a force acting on the first row, then with 1 or 2 empty cells; and on groups with 1 or 2 bowed subassemblies or 1 enlarged one over flats. A preliminary test on the friction coefficient in air between two pads showed some dependance upon the pad surface condition with a scattering factor of 8. Two basic code hypotheses were validated: the rotation of the subassemblies around their axis was negligible after deformation of the group, and the choice of a mean Maxwell coefficient, between those of 1st and 2nd slope, led to very similar results to experimental. The agreement between tests and HARMONIE calculations was suitable, qualitatively for all the groups and quantitatively for regular groups of 3 rings at most. But the difference increased for larger groups of 35 or 41 subassemblies: friction between pads, neglected by HARMONIE, seems to be the main reason. Other reasons for these differences are: the influence of the loading order on the mock-up, and the initial contacts issued from the gap between foot and diagrid-insert, and from manufacture bowings.

59509 **(EDF-R—81H331068) Identification of Super Phenix steam generator by a simple polynomial model.** Rousseau, I. (Electricite de France, 92 - Clamart. Service Informatique et Mathematiques Appliquees). 26 Mar 1981. 81p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82702406.

This note suggests a method of identification for the steam generator of the Super-Phenix fast neutron power plant for simple polynomial models. This approach is justified in the selection of the adaptive control. The identification algorithms presented will be applied to multivariable input-output behaviours. The results obtained with the representation in self-regressive form and by simple polynomial models will be compared and the effect of perturbations on

the output signal will be tested, in order to select a good identification algorithm for multivariable adaptive regulation.

59510 **(HEDL-SA—2554-FP) Swelling behavior of 20% CW 316 Stainless Steel cladding irradiated with and without adjacent fuel.** Makenas, B.J.; Bates, J.F.; Jost, J.W. (Hanford Engineering Development Lab., Richland, WA (USA); Western Zirconium, Ogden, UT (USA)). Jun 1982. Contract AC06-76FF02170. 23p. (CONF-820628—17). NTIS, PC A02/MF A01. Order Number DE82020501.

From 11. international symposium on effects of radiation on materials, American Society for Testing and Materials; Scottsdale, AZ, USA (28 Jun 1982).

Portions of document are illegible.

Swelling behavior has been evaluated for irradiated 20% CW 316 Stainless Steel used as cladding material for mixed-oxide fuel pins in EBR-II. This behavior has been compared statistically with the behavior of a large number of specimens which were irradiated without adjacent fuel in the same reactor. In spite of the chemical environment and stresses experienced by fueled cladding, the fueled and nonfueled cladding appear to behave in a similar manner although some divergence was noted for one of the cases studied.

59511 **(HEDL-SA—2592-FP) Air-cleaning devices for vented filtered LMFBR containment.** Muhlestein, L.D.; Hilliard, R.K. (Hanford Engineering Development Lab., Richland, WA (USA)). Jul 1982. Contract AC06-76FF02170. 8p. (CONF-820704—28). NTIS, PC A02/MF A01. Order Number DE82020279.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

An effort lasting several years is summarized which evaluated, developed and tested air cleaning devices for potential use in breeder reactor containment venting applications. State-of-technology evaluations were completed for both a hypothetical head release accident and a primary vessel melt-through accident. Commercially available systems or components were tested which included HEPA filters, sand and gravel beds, and aqueous scrubbers. Large-scale demonstration tests were completed and results are presented for two- and three-stage conventional aqueous scrubber systems; and for a newly developed passive, submerged gravel scrubber.

59512 **(HEDL-SA—2637-FP) Testing of a passive submerged gravel scrubber for containment venting applications.** McCormack, J.D.; Hilliard, R.K.; Postma, A.K. (Hanford Engineering Development Lab., Richland, WA (USA)). 1982. Contract AC06-76FF02170. 18p. (CONF-820833—11). NTIS, PC A02/MF A01. Order Number DE82020617.

From 17. DOE nuclear air cleaning conference; Denver, CO, USA (1 Aug 1982).

Portions of document are illegible.

Testing and performance of a Submerged Gravel Scrubber is reported. This novel scrubber combines features of a gravel bed filter and a pool scrubber and has potential application for use in vented breeder reactor containment. Four large air cleaning tests with sodium fire aerosols are described. The scrubber-demister operated at 0.47m^3/s with a pressure drop of 9 kPA. The aerosol removal efficiency of the system was 99.98% for a wide range of operating conditions, and had a high mass loading capacity.

59513 **(HEDL-SA—2727) Optimization of the man-machine interface for LMFBRs.** Seeman, S.E.; Colley, R.W.; Stratton, R.C. (Hanford Engineering Development Lab., Richland, WA (USA)). 1982. Contract AC06-76FF02170. 11p. (CONF-820704—22). NTIS, PC A02/MF A01. Order Number DE82020502.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

Portions of document are illegible.

An effort is underway to optimize the roles of man and machine in control of Liquid Metal Fast Breeder Reactors. The work reported on here describes two systems that have been developed. The first of these, MIDAS, is a large data base system developed for use at FFTF as an aid to operators in determining how to proceed with maintenance and repairs to be carried out on plant components. This system is presently in use at FFTF. The second system, the Procedure Prompting System, is a system being developed to demonstrate a new methodology for automatically generating off-normal plant recovery instructions. The methodology for this system has been demonstrated on a model of a small subsystem of FFTF.

59514 (INIS-mf—6937, pp vp) **Application of synthesis methods for calculations of systems with movable fuel.** Goldfeld, A.; Regev, D.; Radkowsky, A.; Ronen, Y. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59515 (INIS-mf—6937, pp vp) **Nuclear fuel development (with special regard to advanced fuels for fast breeders).** Lindner, R. (Karlsruhe Establishment of the Joint Research Centre. Commission of the European Communities (Federal Republic of Germany)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59516 (INIS-mf—6937, pp vp) **Dynamic aspects of pool-type and loop-type LMFBR designs.** Saphier, D. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59517 **(TVA/PUB—82/11) Atoms in Appalachia. Historical report on the Clinch River Breeder Reactor site.** Schaffer, D. (Tennessee Valley Authority, Knoxville (USA)). 1982. 19p. NTIS, PC A02/MF A01. Order Number DE82905981.

The background information concerning the acquisition of the land for siting the Clinch River Breeder Reactor is presented. Historical information is also presented concerning the land acquisition for the Oak Ridge facilities known as the Manhattan Project during World War II.

59518 **(UJV—5449-R,T) Reflector of fast power reactor and its effect on basic reactor characteristics.** Jakab, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). Jun 1980. 25p. (In Czech). Ustav jaderneho vyzkumu CSKAE, Rez, Czechoslovakia.

The effect of the reflector on fast reactor neutron characteristics was tested using a mathematical model. Test models were compiled using the specifications of a typical reactor of an equivalent output of 15a0 MW. The initial two-dimensional arrangement and its conversion to two one-dimensional models, ie., a cylindrical and a slab models are described. The composition of fuel in the reactor cores and blankets corresponds to a steady state refuelling mode. Program J.126.05 was used for computations. The reflector effect was studied on the following space-dependent variables: integral neutron flux density, fast neutron flux density, specific volume output, fission collision density, and capture collision density. The presence of the reflector mostly affects the spatial distribution of neutron flux and neutron densities in the blanket, this mainly in the vicinity of the blanket-reflector interface. The results are tabulated.

59519 **(WAPD-TM—1406) Radiation-induced dimensional changes of AM-350 stainless steel (LWBR development program).** Smith, B.C.; Hyatt, B.Z. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Aug 1982. Contract AC11-76PN00014. 72p. NTIS, PC A04/MF A01. Order Number DE82021943.

AM-350 stainless steel, which is used for fuel rod support grids in the Light Water Breeder Reactor, experiences radiation-induced dimensional changes during in-reactor service. Dimensional changes (strain) were measured periodically for two sets of test specimens irradiated in a test reactor. The STRESME (curved beam) specimens showed a monotonic increase in strain with increasing fluence tending towards saturation of strain at a fast fluence approaching 140 x 10^{20} n/cm^2 (E > 1 MeV). The

GROWME specimens (grid component growth specimens) showed increasing strains with increasing fluence to 27.5 x 10^{20} n/cm^2. Strains of all samples were less than 0.12% at all fluences. Empirical correlations of the test data are presented. The results from the STRESME and GROWME tests showed good agreement.

59520 **(WAPD-TM—1481) Irradiation performance of long-rod duplex fuel-pellet bundle test - LDR test (AWBA Development Program).** Waldman, L.A.; Sphar, C.D.; Alff, T.H. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Apr 1982. Contract AC11-76PN00014. 152p. NTIS, PC A08/MF A01. Order Number DE82022073.

Portions of document are illegible.

The Long Duplex Rod (LDR) test is a five-rod bundle irradiation test of 0.30-inch diameter, 8-foot long, Zircaloy-clad rods containing duplex fuel pellets. These pellets include fissile material in an outer annulus surrounding fertile material in an inner cylindrical core. The rods are axially supported by top or bottom base plates and are laterally supported by an AM-350 stainless steel grid system. Design of the test, which includes duplex pellet annuli of three different compositions (UO_2, ZrO_2-UO_2-CaO, and ThO_2-UO_2), is described; and results of nondestructive examination after operation at peak linear power output of 9 to 18 Kw/ft to a peak depletion of 15 x 10^{20} fissions/cm^3 of compartment (6.0 x 10^4 MWD/Tonne U + Th), or 30 x 10^{20} fissions/cm^3 of fuel annulus volume (1.2 x 10^5 MWD/Tonne U + Th), are presented. It is concluded that performance capability of the duplex pellets is satisfactory for use in prebreeder reactor cores.

2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

59521 **(LA-UR—82-1270) Artery heat pipes for space-power systems.** Merrigan, M.; Prenger, C.; Martinez, H.E.; Runyan, J. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 7p. (CONF-820814—12). NTIS, PC A02/MF A01. Order Number DE82015445.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

Portions of document are illegible.

High-temperature liquid-metal heat pipes are being developed as part of the SP-100 space power system. The operating temperature of the heat pipes is in the 1400 to 1500 K range and the design power level is 15kW per pipe. Baseline design for the heat pipes is an arterial configuration using a fine mesh screen for the arteries and distribution wick. Performance predictions for this configuration have been conducted and the designs characterized as a function of artery geometry, distribution wick thickness, porosity, pore size, and permeability. In parallel with this effort the screen wick materials have been characterized experimentally in terms of pore size and permeability. As a verification of the performance predictions a heat pipe employing two tubular arteries and a distribution wick of tightly compacted, 150-mesh molybdenum screen has been assembled and operated with sodium as a working fluid.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 59563

59522 **(INIS-mf—7060) Swedish Nuclear Power Inspectorate, Quarterly report July-September 1981.** (Statens Kaernkraftinspektion, Stockholm (Sweden)). 1981. 26p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01.

The nuclear power inspectorate is the authority for the supervision of nuclear installation and power plants. The report gives an account of reactor shutdowns and other disturbances. A malfunction of the fuel fabrication at Asea-Atom is commented upon. The plans concerning waste handling are discussed and the project FILTRA for pressure release in reactor containments is referred to.

59523 **(NUREG—0304-Vol.7-No.2) Regulatory and technical reports. Compilation for second quarter 1982, April to June.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Administration). Aug 1982. 150p. NTIS - GPO.

This compilation consists of bibliographic data and abstracts for the formal regulatory and technical reports issued by the US Nuclear Regulatory Commission (NRC) Staff and its contractors. It is NRC's intention to publish this compilation quarterly and to cumulate it annually. The main citations and abstracts in this compilation are listed in NUREG number order: NUREG-XXXX, NUREG/CP-XXXX, and NUREG/CR-XXXX. A detailed explanation of the entries precedes each index.

59524 **(NUREG—0748-V2-N2) Operating reactors licensing actions summary.** (Nuclear Regulatory Commission, Washington, DC (USA)). Mar 1982. 340p. NTIS, PC A15/MF A01.

The Operating Reactors Licensing Actions Summary is designed to provide the management of the Nuclear Regulatory Commission (NRC) with an overview of licensing actions dealing with operating power and nonpower reactors.

59525 **(NUREG—0748-Vol.2-No.7) Operating reactors licensing actions summary.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Resource Management). Aug 1982. 359p. NTIS - GPO.

The operating reactors licensing actions summary is designed to provide the management of the Nuclear Regulatory Commission (NRC) with an overview of licensing actions dealing with operating power and nonpower reactors. These reports utilize data collected from the Division of Licensing in the Office of Nuclear Reactor Regulation and are prepared by the Office of Management and Program Analysis. This summary report is published primarily for internal NRC use in managing the operating reactors licensing actions program. Its content will change based on NRC management informational requirements.

59526 **(NUREG—0750-V13-IND2) Indexes to Nuclear Regulatory Commission Issuances, January-June 1981.** (Nuclear Regulatory Commission, Washington, DC (USA)). 1982. 96p. NTIS, PC A05/MF A01.

Digests and indexes for issuances of the Commission (CLI), the Atomic Safety and Licensing Appeal Panel (ALAB), the Atomic Safety and Licensing Board Panel (LBP), the Administrative Law Judge (ALJ), the Directors' Decisions (DD), and the Denials of Petitions of Rulemaking are presented in this document. These digests and indexes are intended to serve as a guide to the issuances. Information elements common to the cases heard and ruled upon are: Case name (owners of facility); Full text reference (volume and pagination); Issuance number; Issues raised by appellants; Legal citations (cases, regulations, and statutes); Name of facility, Docket number; Subject matter of issues and/or rulings; Type of hearing (for construction permit, operating license, etc.); and Type of issuance (memorandum, order, decision, etc.). These information elements are displayed in one or more of five separate formats arranged as follows: Case Name Index, Digests and Headers, Legal Citations Index, Subject Index, and Facility Index.

59527 **(NUREG—0932) Technical specifications: Virgil C. Summer Nuclear Station, Unit No. 1, Docket No. 50-395, Appendix A to License No. NPF-12.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Aug 1982. 520p. GPO $12.00.

Information is presented concerning safety limits for the reactor core and primary coolant system; safety system settings for reactor trip system instrumentation; reactivity control systems; power distribution limits; instrumentation; reactor coolant system; emergency core cooling system; containment systems; plant systems;electrical power systems; refueling operations; special test exceptions; radioactive effluents; radiological environmental monitoring; site; reactor buildings; and organization, staffing, and reporting requirements.

59528 **(NE-M—1-2T-Rev.-8-82) Stainless steel welding rods and bare electrodes (ASME SFA-5.9 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Aug 1982. 10p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers chromium and chromium-nickel stainless welding rods and bare electrodes for nuclear and associated applications. Material shall conform to the requirements of ASME SFA-5.9; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

59529 **(NE-M—7-4T-Rev.-8-82) Nickel-chromium-iron alloy rod and bar (ASME SB-166 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Aug 1982. 9p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers nickel-chromium-iron alloy rod and bar for nuclear and associated applications. Material shall conform to the requirements of ASME SB-166; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

2108 Economics

REFER ALSO TO CITATION(S) 59329, 59481, 59658

59530 (INIS-mf—6937, pp vp) **Cooling system for inland nuclear plant in Israel.** Schaal, M.; Meron, G. (Israel Electric Corp. Ltd., Haifa). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59531 (INIS-mf—6937, pp vp) **Preliminary evaluation of the cooling options for nuclear power plants in the northern Negev.** Kis, I. (Israel Electric Corp. Ltd., Haifa). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59532 (INIS-mf—7092, pp v) **Concept of radioactive waste disposal from nuclear power plants in Czechoslovakia.** Zocek, J. (Federalni Ministerstvo Paliv a Energetiky, Prague (Czechoslovakia)); Marek, J. (Ceske Energeticke Zavody, Prague (Czechoslovakia)); Seliga, M. (Slovenske Energeticke Podniky, Bratislava (Czechoslovakia)); Hladky, E. (Vyskumny Ustav Jadrovych Elektrarni, Jaslovske Bohunice (Czechoslovakia)). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

The concept is presented of the removal of gaseous, liquid and solid radioactive wastes from the Czechoslovak nuclear power plants V-1, V-2 and Dukovany. The tasks and activities are listed which will have to be carried out for the safe removal of such wastes. For the period of the seventh five-year plan the total capital costs are estimated at 435 million crowns for construction and 240 million crowns for machinery and equipment.

59533 **(UNI-SA—103) Decommissioning of the Ames Laboratory Research Reactor.** Link, B.W.; Voigt, A.F. (UNC Nuclear Industries, Inc., Richland, WA (USA)). 13 Aug 1982. Contract AC06-76RL01857. 22p. (CONF-821005—4). NTIS, PC A02/MF A01. Order Number DE82020522.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

The Ames Laboratory Research Reactor (ALRR) was constructed between 1961 and 1965 on a 35 acre open site about 1 1/2 miles from the Iowa State University campus and the rest of the Ames Laboratory facilities. Initial criticality was attained in February and full power in July 1965. Full-time operation was initiated in June 1966. Final reactor shutdown occurred on December 31, 1977, with an accumulation of 1.52×10^4 megawatt days. The reactor decommmissioning program was initiated at that point, and was essentially completed by October 1, 1981. Total radiation exposure for the decommissioning program was 69.4 man-rem distributed among 92 persons. The total cost of the program was 4.335 million dollars. Although the initial intent was to be able to release the facility for unrestricted use on completion of decommissioning, the widely dispersed presence of low-level fixed radioactivity on reactor room surfaces and in imbedded piping resulted in the application of a monitored use criterion.

59534 **(UNI-SA—105) Engineering and planning for the Shippingport Station Decommissioning Project.** Miller, C.E. Jr.; Eirich, A.J. (UNC Nuclear Industries, Inc., Richland, WA (USA); Department of Energy, Richland, WA (USA). Richland Operations Office). 13 Aug 1982. Contract AC06-76RL01857. 18p. (CONF-821005—5). NTIS, PC A02/MF A01. Order Number DE82020521.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

Portions of document are illegible.

The Shippingport Station Decommissioning Project is currently in the engineering and planning phase. Decommissioning activities are scheduled to begin in the fall of 1984 and end mid-1988. This paper discusses: the purpose and status of the project; the organizations involved; the overall cost, schedule, and technical approach; the management, preplanning, engineering, and decommissioning techniques associated with the project; and its general relevance to commercial nuclear plant decommissioning.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory And Calculation

59535 **(CEA-CONF—5912) Description of an identification method of thermocouple time constant based on application of recursive numerical filtering to temperature fluctuation.** Bernardin, B.; Le Guillou, G.; Parcy, J.P. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Apr 1981. 27p. (In French). (CONF-8104162—1). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702391.

From 14. informal meeting on reactor noise; St. Englmar, F.R. Germany (28 Apr 1981).

Usual spectral methods, based on temperature fluctuation analysis, aiming at thermocouple time constant identification are using an equipment too much sophisticated for on-line application. It is shown that numerical filtering is optimal for this application, the equipment is simpler than for spectral methods and less samples of signals are needed for the same accuracy. The method is described and a parametric study was performed using a temperature noise simulator.

59536 **(CEA-CONF—6010) Effective integral and reactivity effects of ^{238}U and ^{240}Pu resonance parameter uncertainties.** Tellier, Henry. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service d'Etudes des Reacteurs et de Mathematiques Appliquees). Oct 1981. 12p. (CONF-8110186—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702386.

From Consultant meeting on uranium and plutonium iotope resonance parameters; Vienna, Austria (28 Sep 1981).

The resonance parameters of Uranium 238 and Plutonium 240 are known with an uncertainty which induces an inaccuracy in the calculation of the effective multiplication factor of light water lattices. This effect was computed by using the different available files which take into account the successive improvements of the resonance parameter measurements. For Uranium 238, although the reactivity shift between UKNDL 68 and the new evaluations is about 270×10^{-5}, the recent values seem to be satisfactory for the reactor physicist. It is not the same thing for Plutonium 240. For this nuclide the resonance parameters are not known with a good enough accuracy and their values must be improved, specially for the 1.056 eV resonance.

59537 **(EIR—440) New iterative method for solving the monoenergetic diffusion equation with large number of unknowns using group theory.** Pelloni, S. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). Sep 1981. 32p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82906224.

Portions of document are illegible.

A new iterative method for solving the monoenergetic diffusion equation is presented. The experience has shown, that the usual iterative methods used to solve the resulting equations either do not converge at all or the number of inner iterations becomes too large when a high order approximation is used for the spatial flux. The aim has been therefore to develop a new iterative method which leads to small number of iterations even for high order of spatial flux approximation. The present method is additionally accelerated using Chebyshev, Wagner and Andrzejewski procedures which are compared. The SAPHIR Benchmark Test case with a fixed volume source was used for calculations because it is difficult to converge. It is shown that the present method needs for Lagrangian flux approximation of 1st to 4th order almost the same number of iterations which is smaller than 53. Chebyshev acceleration which was the most effective, halved the number of inner iterations.

59538 **(EPRI-NP—2510) Guidebook for the ENDF/B-V nuclear data files.** Magurno, B.A.; Kinsey, R.R.; Scheffel, F.M. (National Nuclear Data Center, Upton, NY (USA)). Jul 1982. Contract AC02-76CH00016. 639p. (BNL-NCS—31451; ENDF—328). NTIS, PC A99/MF A01. Order Number DE82021341.

The National Nuclear Data Center (NNDC) has provided the Electric Power Research Institute (EPRI) with a convenient reference/guidebook to nuclear data derived from the Evaluated Nuclear Data File, Version V (ENDF/B-V). The main part of the edition consists of plots of the major cross sections for each of the General Purpose Nuclides. These plots are reconstructed from the resonance parameters and background cross sections given in the library. The resolution and display format have been selected to show general trends in the data. Following the section for individual nuclides, an intercomparison of cross section ratios (plots of eta and α values) is provided for the major fissile nuclei. The final section contains a table of nuclide properties derived from the data files. Included are thermal (2200m/sec and maxwellian averaged) cross sections, g factors, infinitely dilute resonance integrals and fission spectrum averages.

59539 (IA—1356, pp 33-34) **Second-order cross section sensitivity theory.** Gilai, D.; Greenspan, E. Apr 1980. Dep. NTIS (US Sales Only).

In Research laboratories annual report 1978 and 1979.

59540 (INIS-mf—6937, pp vp) **Generalized bias operators in reactor physics.** Cacuci, D.G. (Oak Ridge National Lab., TN (USA)); Ronen, Y. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering); Wagschal, J.J. (Hebrew Univ., Jerusalem (Israel)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59541 (INIS-mf—6937, pp vp) **Multigroup criticality condition for a space-independent multiplying assembly via the Chapman-Kolmogorov equations.** Aviram, I.; Goshen, S. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59542 (INIS-mf—6937, pp vp) **Are inner iterations essential in multi-dimensional diffusion theory.** Rothenstein, W. (Technion-Israel Inst. of Tech., Haifa. Dept. of Nuclear Engineering). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59543 (INIS-mf—6937, pp vp) **Impact of differences between ENDF/B-V and SOKRATOR ^{235}U fission cross section upon computed integral parameters of a fast reactor benchmark.** Gur, Y.; Yiftah, S. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59544 (INIS-mf—6937, pp vp) **Preliminary sensitivity analysis of differences between ENDF/B-IV and SOKRATOR nuclear data files for ^{239}Pu.** Gur, Y.; Yiftah, S. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59545 (INIS-mf—6937, pp vp) **Time dependent burn-up in one and two dimensions.** Bartal, Y.; Yiftah, S. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59546 (INIS-mf—6937, pp vp) **Lagrange multipliers in data adjustment with response-parameter correlations.** Barhen, J. (Oak Ridge National Lab., TN (USA)); Wagschal, J.J.; Yeivin, Y. (Hebrew Univ., Jerusalem (Israel). Racah Inst. of Physics). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59547 (INIS-mf—6937, pp vp) **Uncertainty analysis of fission spectra.** Wagschal, J.J. (Hebrew Univ., Jerusalem (Israel). Racah Inst. of Physics); Maerker, R.E.; Marable, J. (Oak Ridge National Lab., TN (USA)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59548 (INIS-mf—6937, pp vp) **Adjusted cross-section libraries based on extensive differential and integral data.** Wagschal, J.J.; Yeivin, Y. (Hebrew Univ., Jerusalem (Israel). Racah Inst. of Physics); Marable, J.H.; Weisbin, C.R. (Oak Ridge National Lab., TN (USA)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59549 **(LA—9451-PR) Transport and reactor theory. Progress report, January 1-March 31, 1982.** O'Dell, R.D.; Alcouffe, R.E. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 72p. NTIS, PC A04/MF A01. Order Number DE82021838.

Research and development progress in transport and reactor theory by the Los Alamos National Laboratory's Group T-1 for the second quarter of FY 82 is reported. Included are tasks in the areas of Fission Reactor Neutronics, Transport Methods Supporting Research, Reactor Safety Analysis, Fusion Reactor Nucleonics, and Special Projects.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 59742, 59744, 59765, 59766, 59774

59550 **(EPRI-NP—2425) Stress-intensity factors for surface cracks in pipes: a computer code for evaluation by use of influence functions. Final report.** Dedhia, D.D.; Harris, D.O. (Science Applications, Inc., San Jose, CA (USA)). Jun 1982. 75p. NTIS, PC A04/MF A01. Order Number DE82906468.

A user-oriented computer program for the evaluation of stress intensity factors for cracks in pipes is presented. Stress intensity factors for semi-elliptical, complete circumferential and long

longitudinal cracks can be obtained using this computer program. The code is based on the method of influence functions which makes it possible to treat arbitrary stresses on the plane of the crack. The stresses on the crack plane can be entered as a mathematical or tabulated function. A user's manual is included in this report. Background information is also included.

59551 (INIS-mf—6612, pp 129-146) **Plate heat exchangers for the power industries.** Johansson, H. (Alfa-Laval AB, Lund (Sweden)). 1980. Dep. NTIS (US Sales Only).

From Canadian Nuclear Association heat exchanger reliability seminar; Toronto, Canada (1 May 1980).

A brief survey on the use of plate heat exchangers covers the history of their development, their construction, performance, and advantages. Some applications in conventional and nuclear power plants, including their use in primary cooling, containment cooling, end-shield cooling, fuel-pond cooling, moderator cooling, as well as their use in emergency core cooling, are described.

59552 (INIS-mf—6937, pp vp) **Reactor pressure vessel damage estimate.** Wagschal, J.J. (Hebrew Univ., Jerusalem (Israel). Racah Inst. of Physics); Maerker, R.E. (Oak Ridge National Lab., TN (USA)); Broadhead, B.L. (Tennessee Univ., Knoxville (USA)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beer-shaba, Israel (4 Dec 1980).

59553 (IWGRRPC—79/3, pp 35-48) **Irradiation embrittlement of a variety of RPV steel plates and weldments.** Davies, L.M.; Venables, J.H.; Williams, T.J. (UKAEA Atomic Energy Research Establishment, Harwell). Dec 1979. Dep. NTIS (US Sales Only).

From IAEA specialists' meeting; Vienna, Austria (26 Feb 1979).

A variety of reactor pressure vessel plate and weldment Charpy specimens in the water quenched and tempered condition were irradiated in experimental assemblies in the Dido, Pluto and Herald materials test reactors at a temperature of 523+-5K. The shift in the nil ductility transition temperature (ΔNDTT) was then determined by a series of Charpy impact tests to ASTM, E-23 standards and because the relationship between ΔNDTT and neutron dose varied between different batches of specimens, the ΔNDTT values were normalized to neutron doses of 8 and $10x10^{18}$ $n.cm^2(E>1MeV)$. These results were correlated with the chemical composition of the specimens using the Varsik and Byrne method. The normalized ΔNDTT results plotted against the log of the Varsik and Byrne Chemistry Relation, showed good agreement with a straight line fit and confirmed that sensitivity to neutron irradiation increases primarily with the copper content and with two exceptions all the results considered here could have been described on the basis of copper content alone. The two exceptions occurred in specimens where a high nickel content is combined with a high copper content. Therefore, a high nickel content does need to be considered in its effect on radiation sensitivity. It does appear, however, on limited data that at this irradiation temperature, the beneficial effect of nickel is not lost when the copper content is low.

59554 (NUREG/CR—2827) **Boric-acid corrosion of ferritic reactor components.** Czajkowski, C. (Brookhaven National Lab., Upton, NY (USA)). Jul 1982. Contract AC02-76CH00016. 22p. (BNL-NUREG—51561). GPO $3.50.

An increasing amount of nuclear industry reports have indicated corrosion of ferritic steel components by reactor primary coolant. A literature survey produced information regarding corrosion of AISI 4135 steel in both H_3BO_3 and H_3BO_3 + KOH solutions at 70°F and 140°F. Additional BNL work on both A193-B7 and AISI 4130 material at higher temperatures in both H_3BO_3 and H_3BO_3 + LiOH solutions is also presented. The report concludes that ferritic material is susceptible to corrosion attack by H_3BO_3 solutions up to 600°F, and in H_3BO_3 + LiOH the corrosion rates range between 112 to 130 mils/year, while at 352°F, the corrosion rate drops off to between 46 to 54 mils/year.

59555 (NE-M—1-1T-Rev.-8-82) **Stainless-steel-covered welding electrodes (ASME SFA-5.4 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Aug 1982. 8p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers chromium and chromium-nickel stainless steel covered welding electrodes for nuclear and associated applications. Material shall conform to the requirements of ASME SFA-5.4; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

59556 **Double-clad nuclear-fuel safety rod.** McCarthy, W.H.; Atcheson, D.B. (to Dept. of Energy). US Patent Application 335,995. 30 Dec 1981. 14p. Contract AT03-76SF71031.

A device for shutting down a nuclear reactor during an undercooling or overpower event, whether or not the reactor's scram system operates properly. This is accomplished by double-clad fuel safety rods positioned at various locations throughout the reactor core, wherein melting of a secondary internal cladding of the rod allows the fuel column therein to shift from the reactor core to place the reactor in a subcritical condition.

59557 **Engineering approach to the design of multivariable controls for the turbine steam dump system in a nuclear power station.** Howell, J. (UKAEA Atomic Energy Establishment, Winfrith). pp 8-12 of Control and its applications. Proceedings of the international conference organised by the Computing and Control Division of the Institution of Electrical Engineers at the University of Warwick, 23-25 March 1981. London, England; IEE (1981).

The dump system under examination here is a truly multivariable plant with significant interaction expected to be present between the control loops. This provides an ideal vehicle with which to examine multivariable frequency response techniques that have been developed for control design. The practical design studies using these techniques that have been published have usually been carried out using large interactive computing facilities. The need to bridge the gap between the theoretician and the practical engineer with his programmable calculator is important and is attempted here. The problem is tackled by applying sensitivity analysis combined with engineering judgement to sections of the plant in turn. This permits a number of single input, single output systems to be evolved together with similar 2 x 2 and 3 x 3 input/output systems. These multivariable control problems are then analysed using the characteristic locus (1), inverse Nyquist array (2), and the nested loop techniques. Various conclusions are drawn about not only the required control system structure but also the control systems design methods themselves. The proposed control scheme is outlined. Its implementation using, in general, standard analogue hardware is briefly described noting in particular any additional features that are required for smooth changeover. Commissioning of the control system is discussed.

2203 Fuel Elements

REFER ALSO TO CITATION(S) 59269, 59741

59558 (CEA-CONF—5924) **Fully developed natural convection in closed rod bundles by the finite element method.** Magallon, D. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Jul 1981. 13p. (CONF-810708—4). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702368.

From 2. international conference on numerical methods in thermal problems; Venice, Italy (7 Jul 1981).

A finite element analysis of the fully developed laminar natural convection in vertical rod bundles is presented. A Galerkin formulation is used with piecewise linear interpolation polynomials as shape functions and triangular elements. No restrictions are required on radial temperature boundary conditions. The global stiffness matrix is skyline stored. Natural convection in closed hexagon-

al 7-rod and 91-rod bundles with triangular arrangement is computed for heat fluxes prescribed at the rod surfaces and temperatures specified at the bundle wall. The results show that a coarse mesh is adequate to correctly represent the flow for a large range of Rayleigh numbers. New physical aspects of the natural convection process in finite closed rod bundles are available. This concerns mainly three points. First, ascendant velocities exist in the peripheral region for high Rayleigh numbers. Second, the maximum temperature moves from the center to the periphery of the bundle as the Rayleigh number increases. Third, the use of the half bundle width as a characteristic length is preferable to the hydraulic diameter.

59559 **(EIR—341) Interaction of the measuring instrument-probe system by elastic-inelastic deformation in the case of stress analysis.** Ullrich, U. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). Aug 1978. 8p. (In German). (CONF-820116—1). Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen, Switzerland.

From National seminar on non-destructive testing; Paris, France (26 Jan 1982).

This study considers in an original way the interaction between the testing machine and the probe. The discussion concerning this basic problem is thus reconsidered.

59560 (INIS-mf—6937, pp vp) **Fluid penetration through ruptures in the fuel elements cladding.** Naot, D.; Semiat, R. (Technion-Israel Inst. of Tech., Haifa. Dept. of Nuclear Engineering). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

2204 Control Systems

59561 (INIS-mf—6937, pp vp) **Algorithm for anomaly detection in a nuclear reactor plant.** Benoni, B.; Ben-Haim, Ya. (Technion-Israel Inst. of Tech., Haifa. Dept. of Nuclear Engineering). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 60195, 60204

59562 (INIS-mf—7092, pp v) **Systems approach to problems of disposal of radioactive wastes from nuclear power plants.** Neumann, L. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

A brief characteristic is given of the current state of the disposal of radioactive wastes from nuclear power plants based on the systems approach and a realistic evaluation of the approach is made. Two successive targets of the solution of the given problem are formulated: 1. safeguarding the system of waste disposal in such a manner as to make waste generation a negligible hazard as compared with other human activities, 2. the development and implementation of such a system which optimally solves the problem at the current level of science and technology. Possible solutions are discussed in their inter-relations.

59563 **(NUREG—0884) Final Environmental Statement related to the operation of Perry Nuclear Power Plant, Units 1 and 2 Docket Nos. 50-440 and 50-441, Cleveland Electric Illuminating Company.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Aug 1982. 240p. GPO $7.50.

Portions of document are illegible.

The information in this Final Environmental Statement is the second assessment of the environmental impact associated with the construction and operation of the Perry Nuclear Power Plant, Units 1 and 2, located on Lake Erie in Lake County, about 11 km (7 mi) northeast of Painesville, Ohio. The first assessment was the Final Environmental Statement related to the construction of the plant issued in April 1974, prior to issuance of the construction permits (CPRR-148 and CPPR-149). Plant construction for Unit 1 is currently about 83% complete, and Unit 2 about 43% complete. Fuel loading for Units 1 and 2 currently estimated by the licensee (Cleveland Electric Illuminating Company) for November 1983, with Unit 2 fuel load scheduled for May 1987. The present assessment is the result of the NRC staff review of the activities associated with the proposed operation of the plant.

59564 (SSA—1981-TS-2, pp 387-389) **Methodology of nuclear site selection.** Tine, J. (Ministere de l'Industrie et de la Recherche, 75 - Paris (France). Service Central de Surete des Installations Nucleaires). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

59565 **(TVA/OMS/OHS—82/10) Environmental radioactivity levels, Bellefonte Nuclear Plant, annual report for 1981.** (Tennessee Valley Authority, Muscle Shoals, AL (USA). Office of Natural Resources). Jun 1982. 49p. NTIS, PC A03/MF A01. Order Number DE82904382.

Portions of document are illegible.

The Bellefonte Nuclear Plant (BLN), being constructed by the Tennessee Valley Authority, is located in Jackson County, Alabama, on a peninsula bounded on the west by Town Creek embayment and on the east by Guntersville Reservoir at Tennessee River Mile (TRM) 391.5. The site is approximately 6 miles (10 kilometers) northeast of Scottsboro, Alabama. The plant will consist of two pressurized water reactors; each unit is rated at 3620 MWt and 1271 MWe. Fuel load in Unit 1 is scheduled for no earlier than 1983. A preoperational environmental radiological monitoring program was implemented in August 1978. This program has the objective of establishing a baseline of data on the distribution of natural and manmade radioactivity in the environment near the plant site. This report presents the results obtained from that program during 1981.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 59513, 59533, 59578, 59584, 59585, 59604

59566 **(HEDL-SA—2614) Safety related experience in FFTF startup and operation.** Peterson, R.E.; Halverson, T.G.; Daughtry, J.W. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76FF02170. 12p. (CONF-820704—23). NTIS, PC A02/MF A01. Order Number DE82020512.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

The Fast Flux Test Facility (FFTF) is a 400 MW(t) sodium cooled fast reactor operating at the Hanford Engineering Development Laboratory, Richland, Washington, to conduct fuels and materials testing in support of the US LMFBR program. Startup and initial power ascension testing of the facility involved a comprehensive series of readiness reviews and acceptance tests, many of which relate to the inherent safety of the plant. Included are physics measurements, natural circulation, integrated containment leakage, shielding effectiveness, fuel failure detection, and plant protection system tests. Described are the measurements taken to confirm the design safety margins upon which the operating authorization of the plant was based. These measurements demonstrate that large margins of safety are available in the FFTF design.

59567 (UTNL-R—0084, pp 53-58) **Development of epithermal neutron irradiation field in 'Yayoi' reactor.** Oka, Y.; Akiyama, M.; An, S. (Tokyo Univ. (Japan). Faculty of Engineering). 1980. (In Japanese). Dep. NTIS (US Sales Only).

From Neutronics study meeting on development of new detectors and NE213 scintillator and on medical irradiation in reactors; Tokai, Japan (20 Dec 1979).

The therapy using the neutron capture of boron which selectively annihilates malignant tumor cells is being practiced by the irradiation of thermal neutrons with the reactor of Musashi Institute of Technology or others. However, thermal neutrons have the diffi-

culty of attenuating largely in human bodies. The irradiation of epithermal neutrons can make thermal neutrons reach the deep section inside bodies through the thermalization by moderation. It is also required to reduce the mixing of fast neutrons and γ-ray as far as possible. For this reason, the investigation into producing epithermal neutron irradiation field has been conducted with the fast neutron source reactor "Yayoi". Setting the first target at obtaining the neutron intensity capable of performing therapy, it has been tried to decrease the mixed fast neutrons as far as possible under the limitation of the output of the Yayoi reactor (maximum 2 kW). It has been found preferable that the iron having large inelastic scattering cross section should be used as the first moderator, then graphite or polyethylene as the second moderator utilizing elastic scattering, and thirdly, lead or bismuth as γ shielding. As the result of the comparison carried out through experiments, it has been clarified that in the supposed best system, the irradiation time of 2.6 hours was necessary for obtaining the fluence of 3×10^{12} n/cm^2 at the point of 2.4 cm in a water tank. The neutron exposure during that period was 990 rem, and γ dose during the period was 410 R, and the total dose was below the critical dose of 2000 rem for normal tissues.

2207 Plutonium And Isotope Production Reactors

REFER ALSO TO CITATION(S) 60204

2208 Propulsion Reactors

REFER ALSO TO CITATION(S) 59459

2209 Reactor Safety

REFER ALSO TO CITATION(S) 60169, 60186, 60243, 60286

59568 **(BMFT—150201C) Reliability assessment of the containment of a PWR. Main Report.** Schueeller, G.I.; Kafka, P.; Wellein, R.; Wittmann, F.H.; Zorn, N.F.; Berning, A.; Boulahdour, T.; Mihashi, H.; Bauer, J. (Technische Univ. Muenchen (Germany, F.R.). Inst. fuer Bauingenieurwesen III (Massivbau)). Sep 1981. 104p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82906206.

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The aim of this research effort was to contribute to the development of methods to quantify the risk involved with nuclear power plants. Using a large component, i.e., the containment of the reference plant BIBLIS B (PWR) as sample structure a reliability analysis was performed which is based on realistic assumptions of loads and material properties. For this purpose in many fields it was necessary to develop new methods, collect data, and where not available, obtain data in tests. This effort in which the results of the previous research project RS 201 A,B could be used on one hand concentrated on partial aspects and on the other hand on the development of a methodology for an overall reliability concept. According to the results of the previous project, the keypoints of this effort are the treatment of loss of coolant accidents (small leak), earthquake loading, the possibly resulting crack propagation in the steel hull, and the structural mechanics and material strength aspects of the reinforced concrete hull subjected to impact loading (aircraft impact).

59569 **(CEA-CONF—5993) Probabilistic study of primary pump trip in a P.W.R. reactor: use of response surface methodology.** Bars, C.; Duchemin, B.; Maigret, N.; Peltier, J.; Rostan, O.; Villeneuve, M.J. de; Lanore, J.M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Div. d'Etude et de Developpement des Reacteurs). Sep 1981. 9p. (CONF-810905—38). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702357.

From ANS/ENS topical meeting on probabilistic risk assessment; Post Chester, NY, USA (20 Sep 1981).

This paper describes a probabilistic study about the consequences of the trip or blockage of one of the three PWR reactor primary pumps. The distribution of the input parameters is taken into account and the resulting distribution of the consequence (number of failed fuel rods) is assessed. The necessity to do this study with the response surface methodology and the precautions to take are outlined. The results show that the probability to have failed fuel rods is about 10^{-4} for pump trip and 0.16 for blockage with, in this case, a mean of 196 failed rods, that is 0.5 % of total number of rods.

59570 **(CEA-CONF—5995) Progress in methodology for probabilistic assessment of accidents: timing of accident sequences.** Lanore, J.M.; Villeroux, C.; Bouscatie, F.; Maigret, N. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). Sep 1981. 8p. (CONF-810905—39). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702358.

From ANS/ENS topical meeting on probabilistic risk assessment; Post Chester, NY, USA (20 Sep 1981).

There is an important problem for probabilistic studies of accident sequences using the current event tree techniques. Indeed this method does not take into account the dependence in time of the real accident scenarios, involving the random behaviour of the systems (lack or delay in intervention, partial failures, repair, operator actions ...) and the correlated evolution of the physical parameters. A powerful method to perform the probabilistic treatment of these complex sequences (dynamic evolution of systems and associated physics) is Monte-Carlo simulation, very rare events being treated with the help of suitable weighting and biasing techniques. As a practical example the accident sequences related to the loss of the residual heat removal system in a fast breeder reactor has been treated with that method.

59571 **(CEA-CONF—6013) Core seismic behaviour: linear and non-linear models.** Bernard, M.; Van Dorsselaere, M.; Gauvain, M.; Jenapierre-Gantenbein, M.; Martelli, M. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 15p. (CONF-810801—81). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702359.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The usual methodology for the core seismic behaviour analysis leads to a double complementary approach: to define a core model to be included in the reactor-block seismic response analysis, simple enough but representative of basic movements (diagrid or slab), to define a finer core model, with basic data issued from the first model. This paper presents the history of the different models of both kinds. The inert mass model (IMM) yielded a first rough diagrid movement. The direct linear model (DLM), without shocks and with sodium as an added mass, let to two different ones: DLM 1 with independent movements of the fuel and radial blanket subassemblies, and DLM 2 with a core combined movement. The non-linear (NLM) "CORALIE" uses the same basic modelization (Finite Element Beams) but accounts for shocks. It studies the response of a diameter on flats and takes into account the fluid coupling and the wrapper tube flexibility at the pad level. Damping consists of one modal part of 2% and one part due to shocks. Finally, "CORALIE" yields the time-history of the displacements and efforts on the supports, but damping (probably greater than 2%) and fluid-structures interaction are still to be precised. The validation experiments were performed on a RAPSODIE core mock-up on scale 1, in similitude of 1/3 as to SPX 1. The equivalent linear model (ELM) was developed for the SPX 1 reactor-block response analysis and a specified seismic level (SB or SM). It is composed of several oscillators fixed to the diagrid and yields the same maximum displacements and efforts than the NLM. The SPX 1 core seismic analysis with a diagrid input spectrum which corresponds to a 0,1 g group acceleration, has been carried out with these models: some aspects of these calculations are presented here.

59572 **(CEA-CONF—6016) Experimental validation of the containment code SIRIUS and CASSIOPEE.** Blanchet, Y.; Obry, P.; Louvet, J.; Louvet, P.; Craveleau, J.; Deshayes, M.; Phalip, C. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 11p. (CONF-810801—86). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702401.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Two computer codes are developed for performing the calculations of SUPER-PHENIX integrity when subject to an hypothetical core disruptive accident; both codes are 2D axisymmetric but they use different meshes: Lagrangian for the SIRIUS code, Eulerian and Lagrangian for the CASSIOPEE code. These two codes were first validated against the simple MANON tests. These small scale experiments were performed in deformable cylindrical tanks closed by rigid roof and bottom and completely filled with water. Then a specific experimental program, called MARA, was initiated for validating both codes in SUPER-PHENIX small scale models. The MARA programme, which follows a step-by-step procedure, is now well advanced and the tests fired to date were carried out in deformable vessels closed by a rigid roof; these vessels are bare or feature internal structures. The accident is simulated using a spherical charge of solid low pressure, low density L 54/16 explosive which was purposely developped and tested in the MANON tests mentionned above. In parallel SIRIUS and CASSIOPEE are being compared to other well known containment codes by participating in the international COVA and APRICOT programs. This paper gives a brief survey of some results obtained by both codes in MANON, MARA and APRICOT calculations. Results for both codes are intercompared and are compared, when available, with measured data in the form of chronological records of axial and hoop strains and specific impulses at characteristics positions in water or on the structures.

59573 **(CEA-CONF—6017) Influence of the representation models of the stress-strain law on the LMFBR structures in an HCDA.** Daneri, A.; Toselli, G.; Trombetti, T.; Blanchet, Y.; Louvet, J.; Obry, P. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 13p. (CONF-810801—87). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702402.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Most of analysis involved in mechanical calculations related to explosive accidents in fast breeder reactors are now aware of the inadequacy of certain rough stress-strain laws to representing the correct behaviour of vessel materials. Indeed stress waves along the vessel walls deform the material at a high strain rate with multiaxial loading or reverse loading. Recently different questions have been under investigation in France in this direction and the present study, performed in the frame of the agreement CNEN-CEA, is an example of the way how two very important factors (strain rate and strain hardening) may be taken into account in the constitutive equations of materials subject to dynamic deformations. Several parametric calculations have been carried out with the hydrodynamic structural codes ASTARTE-3/4 and SIRIUS, which are the Lagrangian validated code now available at the CNEN and CEA-Cadarache computing centres. Analysis was performed by comparing two reference calculations relating to the MARA 01 and COVA IT7 explosive tests with experimental data and with other calculations in which different values of the initial hardening and of the strain rates of the tank shell material were introduced. In general both codes give similar results; improvements of predicted axial and hoop strains and of impulses in water have been reached in certain cases but it is difficult to find a general trend and there is no ideal constitutive model: indeed the strain rate is not constant in time, in place and in direction and some parts of the vessels are uniaxially loaded while others are multiaxially loaded.

59574 **(CEA-CONF—6018) MARA 01/02 - experimental validation of the SEURBNUK and SIRIUS containment codes.** Acket, D.; Benuzzi, A.; Yerkess, A.; Louvet, J. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 13p. (CONF-810801—82). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702360.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Predictions obtained using the two hydrodynamic-structural codes SIRIUS (Lagrangian) and SEURBNUK (Eulerian) for the two identical code variation experiments MARA-01 and MARA-02, are presented. The data used in the codes and the assumptions made concerning the variation of material properties throughout the containment vessel are discussed. In particular, the use of two different methods to determine the constitutive law for the charge are described: an "implicit" method which uses quasi-static material properties for the charge calibration containment vessel; and "explicit" method where strain rate effects are also taken into account. The good agreement between the code predictions and experimental data for impulses, roof impact times and final strains is demonstrated.

59575 **(CEA-CONF—6019) Treatment of fluid-structure interaction with the SIRIUS computer code.** Blanchet, Y.; Obry, P.; Louvet, J. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 9p. (CONF-810801—88). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702403.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The explicit 2-D axisymmetric Lagrangian code SIRIUS, developped in CEA Cadarache, is able to deal with transient compressible flows in deformable primary tanks with complex geometries of internal components. The ultimate objective of this code is to perform the analysis of SUPER-PHENIX reactor integrity when subjected to transient loads resulting from an HCDA (Hypothetical Core Disruptive Accident). This paper described the basic equations for fluids and thick elastic-plastic media, the shells modelling and the fluid-shell coupling. As an illustration of the methods implemented in the code three examples are given of the capabilities of SIRIUS for a purely structural calculation and for two situations with fluid-structure interaction.

59576 **(CEA-CONF—6020) Virgin and irradiated hexagonal subassembly duct crushing test and analysis.** Granet, P.; Permezel, P.; Girardin, J.; Lambert, G.; Soler, C.; Allegrad, G.; Romarie, J. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Aug 1981. 26p. (CONF-810801—89). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702404.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The response of hexagonal subassembly ducts in reactor operating conditions submitted to various static and dynamic loadings is of major interest for safety studies. The material properties of the cold-worked type 316 stainless steel hexcans are particularly heterogeneous because of the remaining cold working gradient between flat and corner and of the irradiation inducing embrittlement, depending on the irradiation temperature, as suggested by the substantial reductions of ductility observed in the tensile tests. Therefore, simple tests were performed on irradiated structure to look for brittle failure and for failure mode identification. Quasi-static crushing tests were undertaken on sections cut from virgin and irradiated 316 SS PHENIX hexcans. A constant vertical deflection rate across the opposite faces of the sections was applied with an INSTRON machine set up in a hot cell; the compressive loads and the loaded corner displacements were recorded at 400 and 560 deg C. On the virgin samples, at 400 and 560 deg C, crack initiations and propagations at the location of maximum stresses were observed. As far as the irradiated ducts are concerned, clean failures occurred in lateral corners. The influence of the irradiation temperature is large: the load-deflection diagrams are quite different at 400 and 560 deg C.

Evidence for Young's modulus alteration by irradiation is also presented; elastic-plastic analyses have been made with the bi-dimensional finite element code INCA. Good agreement is observed between the data and the calculations, even at large deflections: this allows to predict the different collapse loads and to obtain the strain values at the collapse points and at the failure locations of the irradiated specimens.

59577 **(CEA-CONF—6056) Probabilistic application of fracture mechanics.** Dufresne, J. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Surete Nucleaire). Apr 1981. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702395.

From 5. International conference on rupture; Cannes, France (29 Mar - 3 Apr 1981).

The different methods used to evaluate the rupture probability of a pressure vessel are reviewed. Data collection and processing of all parameters necessary for fracture mechanics evaluation are presented with particular attention to the size distribution of defects in actual vessels. Physical process is followed during crack growth and unstable propagation, using LEFM (Linear Elastic Fracture Mechanism) and plastic instability. Results show that the final failure probability for a PWR pressure vessel is $3.5\ 10^{-8}$, and is due essentially to LOCAs for any break size. The weakest point is the internal side of the belt line.

59578 **(CNAEM-R—202) Maximum credible accident analysis for TR-2 reactor conceptual design.** Manopulo, E. (Cekmece Nuclear Research and Training Center, Istanbul (Turkey)). 1981. 19p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702361.

A new reactor, TR-2, of 5 MW, designed in cooperation with CEN/GRENOBLE is under construction in the open pool of TR-1 reactor of 1 MW set up by AMF atomics at the Cekmece Nuclear Research and Training Center. In this report the fission product inventory and doses released after the maximum credible accident have been studied. The diffusion of the gaseous fission products to the environment and the potential radiation risks to the population have been evaluated.

59579 **(CONF-820802—12) Integrity of PWR pressure vessels during overcooling accidents.** Cheverton, R.D.; Iskander, S.K.; Whitman, G.D. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE82020812.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

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The reactor pressure vessel in a pressurized water reactor is normally subjected to temperatures and pressures that preclude propagation of sharp, crack-like defects that might exist in the wall of the vessel. However, there is a class of postulated accidents, referred to as overcooling accidents, that can subject the pressure vessel to severe thermal shock while the pressure is substantial. As a result of such accidents vessels containing high concentrations of copper and nickel, which enhance radiation embrittlement, may possess a potential for extensive propagation of preexistent inner surface flaws prior to the vessel's normal end of life. For the purpose of evaluating this problem a state-of-the-art fracture mechanics model was developed and has been used for conducting parametric analyses and for calculating several recorded PWR transients. Results of the latter analysis indicate that there may be some vessels that have a potential for failure today if subjected to a Rancho Seco (1978) or TMI-2 (1979) type transient. However, the calculational model may be excessively conservative, and this possibility is under investigation.

59580 **(EPRI-NP—2529) Value-impact methodology for decision makers.** Stamatelatos, M.G.; Leary, R.H.; Ligon, D.M.; Sibold, B.B. (General Atomic Co., San Diego, CA (USA)). Aug 1982. 130p. NTIS, PC A07/MF A01. Order Number DE82905851.

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This report documents a case study illustrating the use of a value-impact methodology in a nuclear safety system design analysis. The theoretical framework of multi-attribute decision theory is combined with reliability, availability, and probabilistic risk assessment techniques to analyze design alternatives for the auxiliary feedwater system of a specific nuclear plant. Decision attributes in the areas of financial impact, investment risk, health risk, and licensability are used to prioritize the alternatives. A brief critique of the methodology as applied to the case study is offered.

59581 **(EPRI-NP—2530) Development, application, and evaluation of a value-impact methodology for prioritization of reactor-safety R and D projects. Final report.** Fiksel, J.; Cox, A.L.; Richardson, D.L. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Aug 1982. 158p. NTIS, PC A08/MF A01. Order Number DE82906466.

The purpose of this study was to assess the applicability of value-impact analysis (VIA) to the selection of R and D projects in the field of nuclear reactor safety. A practical methodology was developed for describing alternative R and D projects, for eliminating inferior projects, for evaluating the remaining projects, and for ranking them for selection purposes. This approach was demonstrated by applying it to four sample projects dealing with improvements in residual heat removal systems. It was found that the conventional VIA approach is inadequate for the purposes of R and D project selection. A number of modifications are suggested to permit more explicit treatment of the risk and uncertainty inherent in R and D projects and to clarify the basis for choice among them.

59582 **(EPRI-NP—2577) Development of reload safety-analysis methodology and code package: uncertainty analysis. Final report.** Goldstein, R. (Combustion Engineering, Inc., Windsor, CT (USA)). Sep 1982. 79p. NTIS, PC A05/MF A01. Order Number DE82906458.

This report presents the development of a statistical methodology proposed for use with the Electric Power Research Institute (EPRI) Reactor Analysis Support Package (RASP). The EPRI package is an integrated design methodology for use by utilities in reload core design, licensing, and operations support. Existing EPRI codes, including some currently under development, are major elements in the reload safety analysis methodology. As envisioned, the methodology will be applicable to both Pressurized Water Reactor (PWR) and Boiling Water Reactor (BWR) analyses. The current status of code development and availability has mandated that the scope of the present statistical effort be confined to a basic set of codes for the PWR analysis package. This consists of the neutronics (ARMP), systems analysis (RETRAN), and thermal-hydraulics (VIPRE) codes.

59583 **(GRS-A—638) Heat transfer in the containment during and after blowdown.** Schauer, D.A. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). Sep 1981. 147p. (In German). Gesellschaft fuer Reaktorsicherheit (GRS) mbH, Glockengasse 2'5000 Koeln 1, GE.

A two dimensional thermal model and computer code have been used to obtain values for the heat transfer coefficient during and after blowdown. The input data are obtained from specially instrumented thermal blocks located in a blowdown environment. Data from HDR and MARVIKEN have been analyzed. The experimental extrapolated block surface temperature and bulk temperature are the main computer code input. From these inputs the values of the heat transfer coefficient between the steam-air mixture and the block surface have been evaluated during blowdown and also at times from 4 minutes to as much as 4 hours after blowdown. Values were obtained for both steel and painted concrete surfaces. During blowdown, very near the break, peak values of 10,000 to 20,000 W/m^2K are calculated, while several minutes later the magnitude is between 200 to 400 W/m^2K.

59584 **(HEDL-SA—2584-FP) CORA: a thermal and hydraulic transient-analysis computer code for a cluster of reactor-core assemblies.** Johnson, H.G. (Hanford Engineering Development Lab., Richland, WA (USA)). May 1982. Contract AC06-76FF02170. 11p. (CONF-820704—25). NTIS, PC A02/MF A01. Order Number DE82020514.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

The Fast Flux Test Facility (FFTF) is arranged for natural circulation emergency core cooling in the event of loss of all plant

electrical power. This design feature was conclusively demonstrated in a series of four natural circulation transient tests during the plant startup testing program in 1980 and 1981. Predictions of core performance during these tests were made using the Westinghouse Hanford Company CORA computer program. The predictions, which compared well with measured plant data, were used in the extrapolation process to demonstrate the validity of the FFTF plant safety models and codes. This paper provides a brief description of the CORA code and includes typical comparisons of predictions to measured plant test data.

59585 **(HEDL-SA—2587-FP) Transient testing of the FFTF for decay-heat removal by natural convection.** Beaver, T.R.; Johnson, H.G.; Stover, R.L. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76FF02170. 11p. (CONF-820704—26). NTIS, PC A02/MF A01. Order Number DE82018097.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

This paper reports on the series of transient tests performed in the FFTF as a major part of the pre-operations testing program. The structure of the transient test program was designed to verify the capability of the FFTF to safely remove decay heat by natural convection. The series culminated in a scram from full power to complete natural convection in the plant, simulating a loss of all electrical power. Test results and acceptance criteria related to the verification of safe decay heat removal are presented.

59586 **(HEDL-SA—2606-FP) Internal fuel motion in annular fuel as an inherent safety shutdown mechanism during hypothetical LMFBR accidents.** Smith, D.E.; Martin, F.J.; Padilla, A. Jr.; Waltar, A.E. (Hanford Engineering Development Lab., Richland, WA (USA)). 1982. Contract AC06-76FF02170. 13p. (CONF-820704—24). NTIS, PC A02/MF A01. Order Number DE82020513.

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

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It has been postulated that the use of annular fuel would provide an inherent safety shutdown mechanism during hypothetical LMFBR accidents by providing a pathway for molten fuel to be ejected from the active core region to the fission gas plenum. In this paper, a preliminary assessment of the whole-core reactivity consequences of internal fuel motion in annular fuel during hypothetical transient overpower accidents was performed using the MELT-IIIB/FUMO-E code. It was concluded that internal fuel relocation is an effective inherent safety shutdown mechanism for high reactivity ramp rates on the order of 3$/s. Improvement of the transient fission gas release modeling might expand the range of effectivenwss to substantially lower reactivity ramp rates.

59587 (INIS-mf—6937, pp vp) **Comparative study of the reliability of the safety-related electrical systems in a nuclear power plant.** Hertz, Y.; Ilberg, D. (Israel Atomic Energy Commission, Tel Aviv. Licensing Div.). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59588 (INIS-mf—6937, pp vp) **Safety-oriented transient analysis of metal (Pu-Zr) versus oxide (PuO_2-UO_2)-fueled LMFBR.** Saphier, D. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center); Madel, J.T. (Argonne National Lab., IL (USA)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59589 (INIS-mf—6937, pp vp) **Aerosol removal by gravitational settling in PWR containment at LOCA conditions.** Kenigsberg, A. (Israel Atomic Energy Commission, Tel Aviv). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

59590 **(INIS-mf—7051) Investigations on pressure suppression system loads at accident conditions.** Schally, P. (Technische Univ. Muenchen (Germany, F.R.). Lehrstuhl fuer Reaktordynamik und Reaktorsicherheit). (Technische Univ. Muenchen (Germany, F.R.). Fachbereich Maschinenwesen). 1979. 170p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780672.

Thesis.

For simulation of the integral behavior of pressure suppresion systems at accident conditions a mathematical model was developed which simulates a wide range of the loads occurring during a loss-of coolant accident. The multi-zone point model DRASYS serves for mathematical simulation of quasistatic (pressure and temperature build-up in the dry well and the suppression chamber) as well as dynamic loads (free-blowing process, water throw-up and condensing oscillations) in the course of a loss-of-coolant accident. For determination of the state variations with time in the individual pressure sections thermodynamic equilibrium is assumed between steam and water phases. Thermal non-equilibrium states are taken into account if phase separation interfaces between water and steam/air mixture exist. The flows between the individual pressure sections are treated as homogeneous, nonsteady, incompressible flows. For verification of the mathematical model recalculations were made of experiments performed at various test stands. Teh recalculations showed that the mathematical model has got a wide range of application and is suited for design and assessment of pressure suppression systems at accident conditions.

59591 (INIS-mf—7092, pp v) **Nuclear safety and the system of safeguards in nuclear power development in Czechoslovakia.** Beranek, J. (Ceskoslovenska Komise pro Atomovou Energii, Prague). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

An analysis is presented of the main hazards related to the operation of nuclear power plants. This includes the possibility of the misuse of fissile materials for the production of nuclear weapons and the threat posed to the life of man and to the human environment by the operation of the nuclear power plant considering a possible accident. The primary causes of failures and defects of nuclear power plants which may occur from the project design stage to assembly and start-up are eliminated by the consistent surveillance of all operations with regard to nuclear safety. The possibility of failure due to the human factor is maximally restricted by the training of personnel. The material and functional failure of the plant is restricted to minimum by consistent surveillance. The whole operation of the nuclear power plant is safeguarded by safety systems, checks, monitoring and control.

59592 **(LA-UR—82-2298) Comparisons of TRAC-PF1 calculations with semiscale Mod-3 small-break tests S-07-10D, S-SB-P1, and S-SB-P7.** Sahota, M.S. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 11p. (CONF-820802—14). NTIS, PC A02/MF A01. Order Number DE82021922.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

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Semiscale Tests S-07-10D, S-SB-P1, and S-SB-P7 conducted in the Semiscale Mod-3 facility at the Idaho National Engineering Laboratory are analyzed using the latest released version of the Transient Reactor Analysis Code (TRAC-PF1). The results are used to assess TRAC-PF1 predictions of thermal-hydraulic phenomena and the effects of break size and pump operation on system response during slow transients. Test S-07-10D simulated an equivalent pressurized-water-reactor (PWR) 10% communicative cold-leg break for an early pump trip with an emergency core coolant (ECC) injected only into the intact-loop cold leg. Tests S-SB-P1 and S-SB-P7 simulated 2.5% communicative cold-leg breaks for early and late pump trips, respectively, with only high-pressure injection (HPI) into the cold legs. The parameters examined include break flow, primary-system pressure response, primary-system mass distribution, and core characteristics.

59593 **(LA-UR—82-2521) Effect of reactor coolant pumps following a small break in a pressurized water reactor.** Elliott, J.L.; Lime, J.F.; Willcutt, G.J.E. Jr. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 12p. (CONF-820802—11). NTIS, PC A02/MF A01. Order Number DE82021765.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

Small-break loss-of-coolant accidents were calculated to help determine whether to trip the reactor-coolant pumps early in the accident when the reactor scrams or to delay the pump trip (pump trip times ranged from 450 s to no trip at all). Four-in.-diam (approximate) cold-leg breaks in Babcock and Wilcox (B and W) and Westinghouse (W) pressurized-water reactors were investigated using the Transient Reactor Analysis Code, TRAC-PD2. The results indicated that for a 4-in.-diam cold-leg break the optimum mode of pump operation is design dependent. In terms of primary system mass depletion, the case with no pump trip was preferable for the W plant, whereas an early pump trip was preferable for the B and W plant. When the pumps were not operating in the W plant, the loop seals plugged with liquid, leading to a pressure buildup in the upper plenum and, consequently, a high liquid flow through the break. The vent valves in the B and W plant mitigated the consequences of the loop seals plugging; the effect was enough to favor an early pump trip.

59594 **(LA-UR—82-2522) Compare containment subcompartment analysis code evaluation.** Gido, R.G.; Koestel, A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 14p. (CONF-820802—8). NTIS, PC A02/MF A01. Order Number DE82020828.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Nuclear power plant subcompartment analyses are required to determine the containment pressure distribution that might result from a loss-of-coolant accident. The pressure distribution is used to calculate structural and mechanical design loads. The COMPARE code is used widely to perform subcompartment analysis. However, several simplifying assumptions are utilized to facilitate solution of the complex transient, two-phase, multidimensional flow problem. In particular, it is assumed that the flow is homogeneous, in thermodynamic equilibrium, and one-dimensional. In this study, these assumptions are evaluated by performing simplified transport and relaxation analyses. This results in definition of (a) geometric features and early-time periods that produce significant deviations from reality and (b) specific areas that require further study.

59595 **(NUREG/CR—2182-Vol.2) Station blackout at Browns Ferry Unit One: iodine and noble-gas distribution and release.** Wichner, R.P.; Weber, C.F.; Lorenz, R.A.; Davis, W. Jr.; Hodge, S.A.; Mitchell, A.D. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 254p. (ORNL/NUREG/TM—455-Vol.2). NTIS, PC A12/MF A01 - GPO.

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This is the second volume of a report describing the predicted response of Unit 1 at the Browns Ferry Nuclear Plant to a postulated Station Blackout, defined as a loss of offsite power combined with failure of all onsite emergency diesel-generators to start and load. The Station Blackout is assumed to persist beyond the point of battery exhaustion and the completely powerless state leads to core uncovery, meltdown, reactor vessel failure, and failure of the primary containment by overtemperature-induced degradation of the electrical penetration assembly seals. The sequence of events is described in Volume 1; the material in this volume deals with the analysis of fission product noble gas and iodine transport during the accident. Factors which affect the fission product movements through the series of containment design barriers are reviewed. For a reactive material such as iodine, proper assessment of the rate of movement requires determination of the chemical changes along the pathway which alter the physical properties such as vapor pressure and solubility and thereby affect the transport rate. A methodology for accomplishing this is demonstrated in this report.

59596 **(NUREG/CR—2183) Dispersed-flow film boiling of high-pressure water in a rod bundle.** Morris, D.G.; Mullins, C.B.; Yoder, G.L. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 85p. (ORNL/TM—7864). NTIS, PC A05/MF A01 - GPO.

The following six dispersed flow film boiling correlations were assessed using data from the third ORNL transient film boiling experiment (Test 3.08.6C) conducted in the THTF: Dougall-Rohsenow; Dougall-Rohsenow (with Prandtl number evaluated at the wall temperature, as used in RELAP4-MOD7); Groeneveld 5.9; Groeneveld 5.7; Groeneveld-Delorme; and Condie-Bengston IV. The correlations were evaluated with bundle fluid conditions calculated using a homogeneous two-phase flow and thermodynamic equilibrium thermal-hydraulics code. Comparisons made between experimentally determined heat transfer coefficients and the individual correlation's heat transfer coefficients indicate that the Dougall-Rohsenow correlations often overpredict the heat transfer coefficients, while the Groeneveld 5.7, Groeneveld 5.9, and Condie-Bengston IV correlations tend to be in good agreement with the data. The Groeneveld-Delorme correlation underpredicts the data.

59597 **(NUREG/CR—2590) Phase separation phenomena in branching conduits. Topical report Dec 78-Dec 81.** Saba, N.; Lahey, R.T. Jr. (Rensselaer Polytechnic Inst., Troy, NY (USA). Dept. of Nuclear Engineering). Mar 1982. 334p. NTIS, PC A15/MF A01.

The analysis of Light Water Reactor (LWR) Loss-of-Coolant Accidents (LOCA's) requires that one be able to accurately calculate the two-phase flow splits in complex, branching conduits. The purpose of this study is to provide a general method for calculating the phase separation in a branching conduit. The degree of phase separation of a two-phase (air/water) mixture flowing through a plexiglas tee test section was measured. In addition, flow visualization, using high speed photography, was performed. The experimental design considerations, error analysis and the dependence of the observed phase separation on global parameters, such as inlet quality, mass flux and separation angle, are discussed. The pressure gradients were measured along the various conduits and the differential pressure was obtained at the tee junction by extrapolation. It was found that the degree of phase separation was quite pronounced, with the vapor phase preferentially separating into the branch. Using these data, a physically-based empirical model was developed with which to calculate the phasic distribution of a subsonic two-phase mixture in the downstream branches of a branching conduit.

59598 **(NUREG/CR—2609) Thermal-Hydraulic Test Facility Bundle 3 in-core instrumentation and operating history.** Ott, L.J. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 100p. (ORNL/NUREG—75). NTIS, PC A05/MF A01 - GPO.

This report presents the chronological history of the Thermal-Hydraulic Test Facility (THTF) Bundle 3. This bundle is one of the most extensively instrumented bundles ever used in light-water reactor safety research. This compilation documents the in-core instrument measurement sites and operating history for the original Bundle 3 and two major refurbishments to the bundle. Additional information (such as radial dimensions and surface emissivity) that will be needed for thermal analysis of the fuel rod simulator responses during THTF testing is also provided.

59599 **(NUREG/CR—2698) Aerosol characterization from a simulated HCDA: October 1976 - October 1981.** Zanotelli, W.A.; Roesch, D.L.; Miller, G.D. (Mound Facility, Miamisburg, OH (USA)). 7 Jul 1982. Contract AC04-76DP00053. 56p. (MLM—2927). NTIS, PC A04/MF A01.

Environmental conditions simulating the Hypothetical Core-Disruption Accident (HCDA) on a reduced scale provided the following information: aerosols resulting from the condensation of gaseous constituents without sodium generally comprise small, spherical, particles (diameter 0.01 to 0.25 μm) and branched chain-like structures; and aerosols resulting from the condensation of gaseous constituents wih sodium generally comprise spherical, small (diameter 0.01 to 0.50 μm) particles, with some branched chain-like structures and some agglomerating particles. The two main objec-

tives of the study were: (1) the investigation of the chemical reactions and compounds formed from the short-lived vapor state existing in the HCDA event, and (2) the acquisition of a thermodynamic data base for the possible reactions and species formed from the interactions of the U-Pu-O-Na system.

59600 **(NUREG/CR—2710) Mass-flow measurements under PWR reflood conditions in a downcomer and at a core barrel vent-valve location.** Hardy, J.E. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 42p. (ORNL/TM—8331). NTIS, PC A03/MF A01 - GPO.

Instrumentation schemes have been devised and calibrated for two-phase mass flux measurement under simulated pressurized-water reactor reflood conditions. The instrumentation schemes, consisting of two instruments, are to be located in a downcomer and at a vent valve location. More specifically, a drag disk and string probe package will be positioned in three locations in the Japanese Slab Core Test Facility downcomer; a turbine meter and string probe combination will be placed in the core barrel vent valve region of the Japanese Cylindrical Core Test Facility. Calibration in air/water flow under steady-state conditions yielded mass flux algorithms for both instrumentation schemes. The drag disk and string probe calibration gave mass flux estimates to within +40%, -30%. The turbine meter and string probe combination produced estimates to within +-30% for high mass fluxes and +-70% at the low flow rates. Considering the chaotic nature of the flow, the wide range of mass fluxes measured, and the simple homogeneous models employed, the algorithms predict mass flux values reasonably well.

59601 **(NUREG/CR—2802) Interim Reliability Evaluation Program: analysis of the Browns Ferry, Unit 1, nuclear plant. Main report.** Mays, S.E.; Poloski, J.P.; Sullivan, W.H.; Trainer, J.E.; Bertucio, R.C.; Leahy, T.J. (EG and G Idaho, Inc., Idaho Falls (USA); Energy, Inc., Seattle, WA (USA)). Jul 1982. Contract AC07-76ID01570. 121p. (EGG—2199). NTIS, PC A06/MF A01 - GPO.

A probabilistic risk assessment (PRA) was made of the Browns Ferry, Unit 1, nuclear plant as part of the Nuclear Regulatory Commission's Interim Reliability Evaluation Program (IREP). Specific goals of the study were to identify the dominant contributors to core melt, develop a foundation for more extensive use of PRA methods, expand the cadre of experienced PRA practitioners, and apply procedures for extension of IREP analyses to other domestic light water reactors. Event tree and fault tree analyses were used to estimate the frequency of accident sequences initiated by transients and loss of coolant accidents. External events such as floods, fires, earthquakes, and sabotage were beyond the scope of this study and were, therefore, excluded. From these sequences, the dominant contributors to probable core melt frequency were chosen. Uncertainty and sensitivity analyses were performed on these sequences to better understand the limitations associated with the estimated sequence frequencies. Dominant sequences were grouped according to common containment failure modes and corresponding release categories on the basis of comparison with analyses of similar designs rather than on the basis of detailed plant-specific calculations.

59602 **(NUREG/CR—2802-App.B) Interim reliability-evaluation program: analysis of the Browns Ferry, Unit 1, nuclear plant. Appendix B - system descriptions and fault trees.** Mays, S.E.; Poloski, J.P.; Sullivan, W.H.; Trainer, J.E.; Bertucio, R.C.; Leahy, T.J. (EG and G Idaho, Inc., Idaho Falls (USA); Energy, Inc., Seattle, WA (USA)). Jul 1982. Contract AC07-76ID01570. 508p. (EGG—2199-App.B). NTIS, PC A22/MF A01 - GPO.

This report describes a risk study of the Browns Ferry, Unit 1, nuclear plant. The study is one of four such studies sponsored by the NRC Office of Research, Division of Risk Assessment, as part of its Interim Reliability Evaluation Program (IREP), Phase II. This report is contained in four volumes: a main report and three appendixes. Appendix B provides a description of Browns Ferry, Unit 1, plant systems and the failure evaluation of those systems as they apply to accidents at Browns Ferry. Information is presented concerning front-line system fault analysis; support system fault analysis; human error models and probabilities; and generic control circuit analyses.

59603 **(NUREG/CR—2802-App.C) Interim reliability-evaluation program: analysis of the Browns Ferry, Unit 1, nuclear plant. Appendix C - sequence quantification.** Mays, S.E.; Poloski, J.P.; Sullivan, W.H.; Trainer, J.E.; Bertucio, R.C.; Leahy, T.J. (EG and G Idaho, Inc., Idaho Falls (USA); Energy, Inc., Seattle, WA (USA)). Jul 1982. Contract AC07-76ID01570. 97p. (EGG—2199-App.C). NTIS, PC A05/MF A01 - GPO.

This report describes a risk study of the Browns Ferry, Unit 1, nuclear plant. The study is one of four such studies sponsored by the NRC Office of Research, Division of Risk Assessment, as part of its Interim Reliability Evaluation Program (IREP), Phase II. This report is contained in four volumes: a main report and three appendixes. Appendix C generally describes the methods used to estimate accident sequence frequency values. Information is presented concerning the approach, example collection, failure data, candidate dominant sequences, uncertainty analysis, and sensitivity analysis.

59604 **(NUREG/CR—2826) Experiment data report for LOFT large-break loss-of-coolant experiment L2-5.** Bayless, P.D.; Divine, J.M. (EG and G Idaho, Inc., Idaho Falls (USA)). Aug 1982. Contract AC07-76ID01570. 324p. (EGG—2210). NTIS, PC A14/MF A01 - GPO.

Selected pertinent and uninterpreted data from the third nuclear large break loss-of-coolant experiment (Experiment L2-5) conducted in the Loss-of-Fluid Test (LOFT) facility are presented. The LOFT facility is a 50-MW(t) pressurized water reactor (PWR) system with instruments that measure and provide data on the system thermal-hydraulic and nuclear conditions. The operation of the LOFT system is typical of large [approx. 1000 MW(e)] commercial PWR operations. Experiment L2-5 simulated a double-ended offset shear of a cold leg in the primary coolant system. The primary coolant pumps were tripped within 1 s after the break initiation, simulating a loss of site power. Consistent with the loss of power, the starting of the high- and low-pressure injection systems was delayed. The peak fuel rod cladding temperature achieved was 1078 +- 13 K. The emergency core cooling system re-covered the core and quenched the cladding. No evidence of core damage was detected.

59605 **(NUREG/CR—2885) Mechanism and correlation of droplet entrainment and deposition in annular two-phase flow.** Kataoka, I.; Ishii, M. (Argonne National Lab., IL (USA)). Jul 1982. Contract W-31-109-ENG-38. 72p. (ANL—82-44). NTIS, PC A04/MF A01 - GPO.

The droplet entrainment from a liquid film is important to the mass, momentum, and energy transfer processes in annular two-phase flow. For example, the amount of entrainment as well as the rate of entrainment significantly affect the occurrences of the dryout, whereas the post CHF heat transfer depends strongly on the entrainment and droplet sizes. Despite the importance of the entrainment rate, there have been no satisfactory correlations available in the literature. In view of these, correlations for entrainment rate covering both entrance region and equilibrium region have been developed from a simple model in collaboration with data. Results show that the entrainment rate varies considerably in the entrainment development region, however, at a certain distance from an inlet it attains an equilibrium value. A simple approximate correlation has been obtained for the equilibrium state where entrainment rate and deposition rate becomes equal. The result indicates that the equilibrium entrainment rate is proportional to Weber number based on the hydraulic diameter of a tube.

59606 **(PB—82-180282) User's guide for THERMIT-2: a version of THERMIT for both core-wide and subchannel analysis of light water reactors. Final report.** Kelly, J.E.; Kao, S.P.; Kazimi, M.S. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Aug 1981. 228p. (MIT-EL—81-029). NTIS, PC A11/MF A01.

This report provides the THERMIT-2 user with programming and input information. THERMIT-2 is the most recent version of THERMIT. This new version contains all of the features and options of the original version of THERMIT. Additionally, the ability to analyze subchannels as well as improved modeling have

been added to the code. In this report, the programming information is given first. This information includes details concerning the code and data structure. The description of the required input variables is presented next. After the meanings of these variables are given, the sample problems are described and the THERMIT-2 results are presented. THERMIT-2 contains subroutines from the IMSL Library, a proprietary package from International Mathematical and Statistical Libraries, Inc., Houston, Texas. These routines may not be redistributed or removed from this software for use in other software development. IMSL routines included are: LEQTIB, UERTST and UGETIO.

59607 **(SAND—82-0283C) Impact of meltdown-accident modeling developments on PWR analysis.** Haskin, F.E.; Shaffer, C.J. (Sandia National Labs., Albuquerque, NM (USA); Energy, Inc., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-820802—9). NTIS, PC A02/MF A01. Order Number DE82020406.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Models recently incorporated into a new version of the MARCH computer code have altered earlier estimates of some parameter responses during meltdown accidents of PWRs. These models include improved fuel-coolant heat transfer models, new core radiative heat transfer models, improved in-vessel flashing models, improved models for burning of combustible gases in containment, and CORCON1 models for core-concrete interactions. Studies performed with these models have been used to identify and, in some cases, bound meltdown accident analysis uncertainties.

59608 **(SAND—82-1215C) Multiple hydrogen-air deflagrations in containment and the resulting thermal environments.** Kempka, S.N.; Ratzel, A.C.; Baer, M.R. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 17p. (CONF-821026—4). NTIS, PC A02/MF A01. Order Number DE82022027.

From 2. international workshop on the impact of hydrogen on water reactor safety; Albuquerque, NM, USA (3 Oct 1982).

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The computer program HECTR-ES has been developed to determine component thermal responses to combustion and post-combustion environments in nuclear reactor containments. The computer model is described and results obtained from the model are compared to experimental data obtained from hydrogen-air deflagration tests conducted at Sandia Laboratories. Predicted results for multiple-burn simulations are presented for the Grand Gulf Mark III boiling water reactor utilizing hydrogen generation rates obtained from a MARCH computer simulation of an S_2D accident scenario. These results indicate that safety-related equipment in containment will exceed LOCA qualification temperature limits if the spray systems in containment are inoperative for either an 8% or 10% (hydrogen volume) ignition criterion.

59609 **(SAND—82-1987C) Fuel-rod temperature transients during LWR degraded-core accidents.** Briscoe, F.; Rivard, J.B.; Young, M.F. (Sandia National Labs., Albuquerque, NM (USA); UKAEA Culham Lab., Abingdon). 1982. Contract AC04-76DP00789. 10p. (CONF-820802—10). NTIS, PC A02/MF A01. Order Number DE82020413.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

Heat transfer models of fuel rods and coolant have been developed in support of LWR damaged fuel studies underway at Sandia National Laboratories for the NRC. A one-dimensional, full-length model simulates a PWR fuel rod; a two-dimensional, 0.5 m model simulates 9-rod bundle experiments to be performed in the Annular Core Research Reactor. The models include zircaloy oxidation, heat transfer by convecting steam/hydrogen flow, and radiation between surfaces through an absorbing/emitting gas. Characteristics of the one-dimensional reactor fuel rod model for two types of accident sequence are reported, as well as comparisons with MARCH code results.

59610 **(SAND—82-2001C) Arkansas Nuclear One Unit One risk-analysis results.** Kolb, G.J.; Kunsman, D.M. (Sandia National Labs., Albuquerque, NM (USA); Science Applications, Inc., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 9p. (CONF-820802—13). NTIS, PC A02/MF A01. Order Number DE82022026.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

This paper presents the results of the analysis of Arkansas Nuclear One Unit One nuclear power plant which was performed as part of the Interim Reliability Evaluation Program (IREP). ANO-1 is a Babcock and Wilcox pressurized water reactor. The IREP has several objectives, three of which are achieved by the analysis presented in this paper. The three objectives met are: (1) the identification of those accident sequences which are expected to dominate the public health and safety risks associated with operation of ANO-1, (2) the development of state-of-the-art plant system models which can be used as a foundation for subsequent, more intensive applications of probabilistic risk assessment on ANO-1, and (3) the increase in number of experienced practitioners of probabilistic risk assessment. The estimated core melt frequency for ANO-1 is similar to values predicted by probabilistic risk assessments of other light water reactors.

59611 **(SAND—82-2005C) Assessment of RALOC-MOD1 with 1980 updates.** Buxton, L.D. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 15p. (CONF-821026—2). NTIS, PC A02/MF A01. Order Number DE82020606.

From 2. international workshop on the impact of hydrogen on water reactor safety; Albuquerque, NM, USA (3 Oct 1982).

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This report discusses the results of some of our efforts to assess the ability of RALOC to perform the analyses for which it was originally designed and to determine the extent of the modifications necessary to allow more extensive analyses. The assessment of RALOC at SNLA has been based on: comparisons with experimental data from Battelle-Institut e.V. Frankfurt (BF) for hydrogen/nitrogen injection into a model containment; several thought experiments (using the BF test geometry) which were designed to test the code's capabilities under more unusual and perhaps more adverse boundary conditions; and comparison with experimental data from Hanford Engineering Development Laboratory (HEDL) for injection of hydrogen/steam and helium/steam mixtures into a two-room geometry.

59612 **(INIS-mf—7070) Material problems concerning the safety of light water reactors.** Bocek, M.; Dienst, W.; Hofmann, P.; Leistikow, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung). [nd]. 4p. (In German). (CONF-8106226—(Summ.)). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780681.

From Annual meeting of the Deutsche Gesellschaft fuer Metallkunda e.V.; Baden-Baden, F.R. Germany (9 Jun 1981).

The problems dealt with in this lecture and the corresponding investigations refer to the behavior of LWR fuel rods at loss-of-coolant accidents. In the foreground is the deformation of zircaloy 4 cladding until rupture will take place, the following aspects being pointed out: obstruction of emergency cooling of fuel assemblies by heavily deformed cladding tubes, release of radioactive fission products through cracks in the cladding, local fragmentation of the fuel rods caused by extensive embrittlement of the cladding tubes.

25 ENERGY STORAGE

2502 Compressed Gas

59613 (EPRI-EM—2210-Vol.4) Preliminary design study of compressed-air energy storage in a salt dome. Volume 4. CAES turbomachinery design. Final report. (Middle South Services, Inc., New Orleans, LA (USA); Brown Boveri Corp., North Brunswick, NJ (USA); Fenix and Scisson, Inc., Tulsa, OK (USA); United Engineers and Constructors, Inc., Philadelphia, PA (USA)). Jun 1982. Contract AC02-77ET29015. 273p. NTIS, PC A12/MF A01. Order Number DE82019781.

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A summary is presented of the study undertaken by the Turbomachinery Subcontractor on Task 1, according to instructions received from the Middle South Services (MSS), the US Department of Energy (DOE) and the Electric Power Research Institute (EPRI). The subject of this study was to investigate the question of whether it would be possible to build an air storage generating plant capable of operating economically and using leached-out salt domes as air reservoirs. In the course of the work performed on Task 1, the Turbomachinery Subcontractors have on various occasions supplied information on the results obtained, in the form of preliminary subreports. The present summary includes all the previous reports, most of which have been revised to a large extent.

2505 Flywheels

59614 (CONF-820814—27) Analysis of fixed-base flywheel systems for electric-utility applications. Olszewski, M. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE82020809.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

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The demand for electricity exhibits diurnal, weekly, and seasonal variations. Because of these variations utilities experience off-peak times when the baseload generation capacity is not fully utilized. In addition, they experience on-peak loads substantially in excess of baseload generation capability. The use of energy storage would allow the cheaper base load generation to be used in place of expensive oil-fired combustion turbine power for peaking applications. This study concentrated on the very short-term peaking spikes experienced by utilities. These spikes are characterized as having a duration of up to 2 hours and a load of 85 to 100% of the utility's peak demand. This represents about 4% of the total annual amount of energy generated by utilities but about 13% of the total fuel costs. The purpose of the study is to assess the potential role for flywheels as a utility storage option and establish research and development priorities for fixed-base flywheel systems.

59615 (CONF-820827—7) Flywheel testing and evaluation. Steele, R.S. (Oak Ridge Y-12 Plant, TN (USA)). 1982. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01. Order Number DE82020894.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

During the past several years, the DOE Mechanical Energy Storage program has supported spin testing of high performance composite flywheels to verify analytical predictions, identify unknown parameters, and understand the factors influencing flywheel reliability. In general, the results have supported the early predictions of flywheel performance; but certain real world factor evaluations now require further investigation. This paper discusses six general statements regarding the state-of-the-art in composite flywheels technology and presents the supporting data. (1) Composite flywheel performance is superior to that of metallic flywheels, while (2) presenting less severe containment requirements. (3) Composite flywheel fatigue life exceeds 1000 cycles. (4) Thermal considerations dictate a low pressure environment. (5) Balance characteristics of composite flywheels require special suspension provisions. And finally, (6) analytical models predict performance with increasing confidence and are thus becoming more useful in establishing the reliability of the rotor. Testing efforts must now address questions relating to lifetime, reliability, system design, and cost.

59616 (CONF-820827—8) Flywheel evaluation at ORFEL. Rotor testing in FY 1982. Babelay, E.F. Jr. (Oak Ridge Y-12 Plant, TN (USA)). 1982. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE82020825.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

This paper summarizes the results and observations of flywheel spin tests conducted in the Oak Ridge Flywheel Evaluation Laboratory for the Mechanical Energy Storage Program at the Oak Ridge National Laboratory. Test results include the completed cyclic fatigue test of a flywheel designed and fabricated by General Electric. This test was started during FY 1981 and some results were reported at the 1981 Annual Contractors' Review. Ultimate speed evaluations for a modified General Electric rotor and three low cost flywheels built by Owens-Corning Fiberglass and Lord Kinematic Corporation are also reported.

59617 (UCRL—86557-82) Flywheel rotor and containment technology development, FY 1982. Kulkarni, S.V. (Lawrence Livermore National Lab., CA (USA)). 18 Aug 1981. Contract W-7405-ENG-48. 16p. (CONF-820827—4). NTIS, PC A02/MF A01. Order Number DE82020729.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The status of the flywheel rotor and containment technology development program during FY 1982 is reviewed in this paper. The specific objectives of the different activities are delineated, and progress during the present reporting period is described briefly.

2506 Thermal

REFER ALSO TO CITATION(S) 59679

59618 (AD-A—112813/1) Application of the heat balance integral to conduction phase change problems. Lunardini, V.J. (Cold Regions Research and Engineering Lab., Hanover, NH (USA)). Dec 1981. 23p. (CRREL—81-25). NTIS, PC A02/MF A01.

The problem of heat conduction with phase change--often called the Stefan problem--includes some of the most intractable mathematical areas of heat transfer. Exact solutions are extremely limited and approximate methods are widely used. This report discusses the collocation method for the heat balance integral approximation. The method is applied to some standard problems of phase change--Neumann's problem--and a new solution is presented for the case of surface convection for a semi-infinite body. Numerical results are given for soil systems and also for materials of interest in latent heat thermal storage.

59619 (CONF-820814—23) Development of heat storage building materials. Grodzka, P.; Price, J.; Serbin, C.; Solomon, A. (Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.; Lockheed Missiles and Space Co., Huntsville, AL (USA)). 1982. Contract W-7405-ENG-26. 4p. NTIS (US Sales Only). Order Number DE82020814.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

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A heat storage building material concept currently under investigation consists of incorporating phase change material (PCM) into double-walled hollow-channeled plastic wallboard of approximately 1/4 inch thickness. The resulting panels will be in the form of thin sheets, approximately 4 x 8 square feet in area. The possible PCM's under study include Glauber's salt, calcium chloride hexahydrate, and lithium nitrate trihydrate. The aim of the panel is to increase the thermal inertia of the building structure and in this way to make possible significant energy savings for the structure. In this paper we describe our study of this concept and of the broader question of its impact on the house load and comfort, as it has proceeded thus far. In particular, we sketch the results of a preliminary analysis of the behavior of the PCM's and PCM panels for various

heat input modes. We then describe mathematical modeling techniques for a building.

59620 **(CONF-820814—25) Heat-pump cool storage in a clathrate of freon.** Tomlinson, J.J. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 5p. NTIS (US Sales Only). Order Number DE82020815.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

Portions of document are illegible.

This paper presents the analytical description and preliminary technical assessment of a unique heat pump/storage system in which the conventional evaporator of the vapor compression cycle is replaced by a highly efficient direct contact crystallizer. The thermal storage technique requires the formation of a refrigerant gas hydrate (a clathrate) and exploits an enthalpy of reaction comparable to the heat of fusion of ice. Additional system operational benefits include cool storage at the favorable temperatures of 4 to 7°C (40 to 45°F), and highly efficient heat transfer rates afforded by the direct contact mechanism. In addition, the possibilities of using this technique to provide isothermal storage at higher temperature levels is discussed.

59621 **(CONF-820827—9) Basic chemical studies related to low-temperature thermal-energy storage. Task I. Thermodynamic properties and interactions of salt hydrates used as phase-change materials.** Braunstein, J. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020826.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The purpose of this task is to critically review the state-of-the-art of salt hydrates as phase change materials. Areas for review include phase equilibria, nucleation and melting kinetics of the commonly used hydrates (e.g., $Na_2SO_4 \cdot 10H_2O$, $Na_2S_2O_3 \cdot 5H_2O$, $CaCl_2 \cdot 6H_2O$, $MgCl_2 \cdot 6H_2O$) with the objective of identifying research that would result in more practicable use of these materials. A survey of the literature has been made and a list of recommended basic chemical research has been prepared.

59622 **(CONF-820827—10) Development of chemically bonded ceramic materials for use in thermal-energy-storage devices.** Brosnan, D.A. (Oak Ridge National Lab., TN (USA); Materials Consultant Associates, Inc., Pell City, AL (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020827.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The objective of this program is to develop phosphate and calcium aluminate cement bonded ceramic materials based on North Carolina olivine which are capable of serving as the heat storage media in electric furnaces using the off peak power heating concept. These compositions will be castable refractories formed without the conventional step of powder pressing and cured at temperatures below 315°C which eliminates the conventional ceramic firing step which requires temperatures in the range of 1370 to 1480°C for olivine bricks. New binder technologies have been developed for use with NC olivines whereby phosphate bonded materials may be produced with cured densities of 2.20 g/cm³ (138 lb/ft³) which can withstand heating rates of 140°C/hr to 1200°C without appreciable thermal shock damage. Calcium aluminate cement bonded compositions with densities of 2.30 g/cm³ also appear capable of similar heating rates. Experiments with gap-graded castable compositions show further improvements in bulk density and are expected to improve thermal shock properties of the various compositions. Additions of iron oxide rich minerals to the compositions have produced cured densities of 2.58 g/cm³ which is similar to the density of commercial fired olivine bricks. These iron oxide rich compositions may have higher volumetric heat capacities than fired olivine bricks. Tasks for FY83 include: continued optimization of compositions; determination of thermal properties; and a component test program using commercial storage heaters.

59623 **(CONF-820827—19) Mathematical modeling of TES subsystems.** Solomon, A.D. (Oak Ridge National Lab., TN (USA); Union Carbide Corp., Oak Ridge, TN (USA). Computer Sciences Div.). 1982. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE82020895.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

It is believed that the use of phase change materials (PCMs) levels the load and improves the comfort. This is because large amounts of heat can (in principle) be stored in the PCM at its phase change temperature. During the past year we have focused on the options available to us when PCM is put into the building structure using analytical and numerical studies, we have identified the optimal approaches to doing this. Among other questions, we looked at the efficacy of locating the PCM at the wall surface as opposed to internal storage, the necessity of exposing the PCM directly to beam radiation, and the optimal choice of the PCM. Many of our projections and recommendations spring from a one-room computer simulation of solar flux room thermal processes.

2509 Batteries

REFER ALSO TO CITATION(S) 59700

59624 **(BNL—31458) Zinc deposition in acid electrolytes.** McBreen, J.; Gannon, E. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 1p. (CONF-821015—1). NTIS, PC A02/MF A01. Order Number DE82017632.

From Electrochemical Society fall meeting; Detroit, MI, USA (17 Oct 1982).

In the past decade, two aqueous zinc/halogen batteries, the zinc/chlorine, and the zinc/bromine systems, have been considered for load-leveling and vehicular applications. Even though considerable progress has been made in engineering these batteries, several problems related to the zinc electrode have yet to be solved. These are related to the growth of dendritic zinc and a maldistribution of the zinc deposit that can occur during cycling. Both problems are exacerbated by recharge of the battery after partial discharge of the zinc deposit. A survey of the literature indicates that a more desireable zinc morphology can be achieved by use of inorganic additives, fluorinated surfactants, and A-C modulation of the charging current. In this investigation, the deposition of zinc from zinc bromide and zinc chloride electrolytes was investigated under conditions that precluded dendrite growth. The techniques used were cyclic voltammetry, the potential step technique and scanning electron microscopy. The variables investigated were the substrate (zinc and dense graphite), electrolyte pH, inorganic additives (Pb^{++} and Bi^{3+}) and A-V modulation of the charging potential by superimposed square waves.

59625 **(DOE/CH/10012—T1) Sodium-sulfur battery development economic analysis. Phase IV topical status report.** (Ford Aerospace and Communications Corp., Newport Beach, CA (USA). Aeronutronic Div.). Sep 1980. Contract AM02-79CH10012. 55p. NTIS, PC A04/MF A01. Order Number DE82021824.

Portions of document are illegible.

An attempt is made to prevent realistic costs for cells in three sizes and for load-leveling batteries utilizing two of the cell sizes (211- and 402-Wh) in about the 1986-1988 time frame. The cost study essentially complies with the A. D. Little cost guidelines of September, 1979. The cell designs used for this study are based on existing technology extrapolated to include techniques for high-rate production and probable materials substitutions indicated by current development work. The costs presented, therefore, are considered to be conservatively high rather than optimistically low. Improvements in component fabrication yield factors and cell design, for instance, will lower the cost estimates. Results are detailed. (WHK)

59626 **(DOE/CH/10012—T2) Sodium-sulfur battery development. Phase IV interim report, 1 March 1978 to 29 February 1979.** Harlow, R.A. (Ford Aerospace and Communications Corp., Newport Beach, CA (USA). Aeronutronic Div.). 1 Oct 1980. Contract AM02-79CH10012. 195p. NTIS, PC A09/MF A01. Order Number DE82021825.

This report summarizes the activities of the DOE-Ford Sodium-Sulfur Battery Development Program during the period 1 January 1979 to 1 March 1980. During this period, considerable progress was made toward development of cells with improved performance, durability, producibility, and safety. Although the work strongly emphasized cells for stationary energy storage (SES), many of the accomplishments are directly applicable to (smaller) electric-vehicle (EV) cells. Cell related activities included development of high quality β''-alumina solid electrolytes and of ceramic processing improvements. Alternate cell configurations were analyzed to identify potential designs of higher volumetric efficiencies than the present tubular designs. Supporting research included studies of cell degradation and corrosion resistant materials. Destructive cell safety tests were successful in verifying safe designs. Economic analyses were performed on projected large-scale production quantities of both SES and EV cells, and on an entire 100-MWh SES battery system designed during Phase IV. Conceptual designs were evaluated for SES and EV batteries.

59627 **(DOE/NASA/51044—26) Results of chopper-controlled discharge life-cycling studies on lead-acid batteries.** Ewashinka, J.G.; Sidik, S.M. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1982. Contract AI01-77CS51044. 16p. (NASA-TM—82912; CONF-820814—22). NTIS, PC A02/MF A01. Order Number DE82020702.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

A group of 108 state-of-the-art nominally 6 volt lead-acid batteries were tested in a program of one charge/discharge cycle per day for over two years or to ultimate battery failure. The primary objective of this program was to determine battery cycle life as a function of depth-of-discharge (25 to 75%), chopper frequency (100 to 1000 Hz), duty cycle (25 to 87.5%), and average discharge current (20 to 260 A). The secondary objective of this test program was to determine the types of battery failure modes, if any, were due to the above parameters. The four parameters above were incorporated in a statistically designed test program which is a variation of a central composite factorial design experiment.

59628 **Multifunctional reference electrode.** Redey, L.; Vissers, D.R. (to Dept. of Energy). US Patent Application 335,997. 30 Dec 1981. 15p. Contract W-31-109-ENG-38.

A multifunctional, low mass reference electrode of a nickel tube, thermocouple means inside the nickel tube electrically insulated therefrom for measuring the temperature thereof, a housing surrounding the nickel tube, an electrolyte having a fixed sulfide ion activity between the housing and the outer surface of the nickel tube forming the nickel/nickel sulfide/sulfide half-cell are described. An ion diffusion barrier is associated with the housing in contact with the electrolyte. Also disclosed is a cell using the reference electrode to measure characteristics of a working electrode.

29 ENERGY PLANNING AND POLICY

REFER ALSO TO CITATION(S) 59696

59629 **(DOE/S—0010-82) Secretary's annual report to Congress. Secretary's statement, program review, and outlook.** (USDOE Office of the Secretary, Washington, DC). Aug 1982. 176p. NTIS, PC A09/MF A01. Order Number DE82021878.

This report covers activities of all elements of the Department of Energy except the independent Federal Energy Regulatory Commission, which issues its own annual report. This report is supplemented by three annexes: (1) The Fifth Report to Congress - Comprehensive Program and Plan for Federal Energy Education, Extension, and Information Activities (Published December 1981 by the Office of State and Local Programs, Office of Conservation and Renewable Energy, US Department of Energy); (2) Third Annual Report to Congress on the Automotive Technology Development Program (Published February 16, 1982, by the Office of Vehicle and Engine Research and Development, Office of Conservation and Renewable Energy, US Department of Energy); and (3) Observations and Recommendations on the Future of the Energy Extension Service Program: Fourth Report by the National Energy Extension Service Advisory Board (Published January 1982 by the Office of State and Local Programs, Office of Conservation and Renewable Energy, US Department of Energy).

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 59631

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 59147

59630 **(PB—82-185331) Behavioral and social aspects of energy consumption and production: preliminary report.** (National Academy of Sciences - National Research Council, Washington, DC (USA)). Mar 1982. 74p. NTIS, PC A04/MF A01.

This report identifies thirteen areas in which the behavioral and social sciences, in particular the noneconomic disciplines, may make a contribution to energy policy and analysis. It describes three topics from within this set chosen for consideration in the project's second year. One topic, the behavior of energy consumers, receives detailed discussion. Five conceptions of the energy consumer are described, each of which contains some validity. The report discusses some implications of the facts that energy consumers imitate and are influenced by their associates, that behavior has a momentum of its own aside from notions of rationality, and that energy consumption is influenced by personal values and norms. The report also emphasizes certain features of the environment in which energy consumers operate, including historical factors that make energy invisible to most consumers, the assurance that consumers will receive conflicting, confusing, and inaccurate information about energy, the symbolic meanings that have been associated with energy use, the limitations on consumer choice about energy use, and the conflict between the value of efficiency and values of equity and flexibility in the energy system. An appendix presents preliminary thoughts about a second topic, preparation and response in energy emergencies.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 59660, 60202

59631 **(GAO/PART—82-1) Report to the President and the Congress. Performance evaluation of the Energy Information Administration, Department of Energy.** (General Accounting Office, Washington, DC (USA). Professional Audit Review Team). 19 May 1982. 61p. NTIS, PC A04/MF A01 - Professional Audit Review Team, Room 308-100 Indiana Ave. NW, Washington, DC 20001. Order Number DE82905231.

This report discusses the results of the Professional Audit Review Team's annual evaluation of the performance of the Energy Information Administration (EIA), as required by the Department of Energy Organization Act (Public Law 95-91, dated August 4, 1977). The report addresses major funding and staffing reductions in EIA's activities and evaluates EIA's performance of functions that are central to its capability to effectively perform its role. Accordingly, the report should be useful in deliberating energy information issues in the context of their current operational environment.

59632 **(LBL—14496) Energy sources and climate.** Calvin, M. (Lawrence Berkeley Lab., CA (USA)). 27 May 1982. Contract AC03-76SF00098. 15p. NTIS, PC A02/MF A01. Order Number DE82020612.

An analysis is made of the existing data on the effect of the use of fossil carbon as an energy source over the last two centuries on the atmospheric composition of the earth. It is concluded that there is a set of independent observations which, taken together, make likely a global climatic change as a result of the increased carbon dioxide level from these fossil energy sources. Alternative sources are recommended.

2904 Natural Resources

REFER ALSO TO CITATION(S) 59648, 59649, 59650, 59651, 59652

59633 **Regional issues in energy development: a dialogue of east and west.** Leman, C.K. (ed.). Cambridge, MA; University Consortium for Research on North America (1981). 87p. (CONF-8104174—(Summ.)). University Consortium for Research on North America, 1737 Cambridge St., Cambridge, MA 02138.

From Joint Canadian/US symposium on regional issues in energy development: a dialogue of east and west; Boston, MA, USA (10 Apr 1981).

Topics presented at the symposium include: comparing Canadian and US regional energy conflicts, beyond greed and envy; summary of energy impacts on resource-rich and resource-poor regions; equity and efficiency in regional energy policy; technical solutions to political problems; political solutions to political problems; and a summary, pulling apart or getting together, an assessment of the dialogue. (GHT)

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 59354, 59629

59634 **(INIS-mf—7087) Annual report 1980.** (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). 1981. 48p. (In German). NTIS (US Sales Only), PC A03/MF A01.

The work performed at the Forschungszentrum Seibersdorf is divided into five basic areas: energy and nuclear safety; new technologies and methods; world defence, health and maintenance; development and information; and planning and coordination. These areas are briefly described and various projects within them are outlined. (G.T.H.).

59635 **(UCID—17271-82) E-Division activities report.** Barschall, H.H. (comp.). (Lawrence Livermore National Lab., CA (USA)). Jul 1982. Contract W-7405-ENG-48. 69p. NTIS, PC A04/MF A01. Order Number DE82020857.

This report describes some of the activities in E (Experimental Physics) Division during the past year. E-Division carries out research and development in areas related to the missions of the Laboratory. Many of the activities are in pure and applied atomic and nuclear physics and in materials science. In addition this report describes development work on accelerators and on instrumentation for plasma diagnostics, determination of atmospheric oxygen, and of nitrogen in tissue.

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 59285, 59302, 59478, 59580

59636 **(EIR—342) Role of nuclear energy in the more efficient exploitation of fossil fuel resources.** Seifritz, W. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). Jun 1978. 11p. Eidgenoessisches Inst. fuer Reaktorforschung, Wuerlingen, Switzerland.

The energy theory of value, being a valuable addition to the debate on the rational exploitation of man's energy reserves, is applied in order to clarify the presently confused energy input/output relations for nuclear and solar systems as they interact with fossil fuel. It is shown on the basis of purely energetics considerations that the nuclear route - at present and in future - is a very efficient way to stretch out and finally to substitute for the limited fossil fuel resources. This is particularly true if one considers the transistory phase where the substituting process has to exhibit a rapid exponential growth rate. The energetical effectiveness of the production of a synthetic fuel, as for example hydrogen by water splitting processes, is addressed at the end and serves to give an idea how effectively the energy available in fossil fuels can be amplified by virtue of the coupling of nuclear energy into the process.

59637 **(INIS-mf—7063) Report on overseas visit October-November 1980.** Johns, R.K. (South Australian Dept. of Mines and Energy, Adelaide). Dec 1980. 101p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780690.

This report covers a wide range of energy issues and aspects of energy resource development and management, particularly with regard to uranium. Information was gathered during discussions and inspections in Canada, England, Holland, France, Sweden and Japan. Canadian uranium deposits vie with those of Australia for markets and rigorous programmes of exploration and development are being undertaken. There are 11 nuclear reactors in operation, generating 5475 MWe, with a further nine under construction. In the United Kingdom there are 16 nuclear reactors in operation, including a fast breeder. They generate 13% of Britain's electricity requirements. By the year 2000 this is expected to rise to 30%. France is involved with all phases of the nuclear fuel cycle - mining, milling, processing, conversion, enrichment, fuel fabrication, reactors, reprocessing of spent fuels and disposal of radioactive wastes. The 23 reactors in operation generate 25% of electricity output. Japan has no real alternative but to expand its nuclear energy programme. There are 21 nuclear power plants in operation and seven units under construction. Expansion of enrichment capacity is being undertaken in England, Holland and France, new facilities are being installed in Japan, and new chemical processes are under investigation in France and Japan. In France, vitrification of wastes has been undertaken successfully at Marcoule since 1978. Final storage of high-level radioactive waste has been researched in Sweden where it is envisaged that a repository will be put into operation through deposition of encapsulated waste containers in granite when required, about 2020.

59638 (INIS-mf—7092, pp v) **Information level and promotion in nuclear power.** Bohal, L. (Ceske Energeticke Zavody, Prague (Czechoslovakia)). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

The importance is underlined of qualified information on nuclear power, namely in areas where nuclear power installations are being built. Modern information media may be used for this purpose.

59639 (INIS-mf—7092, pp v) **Political impact of nuclear power development.** Povolny, M. (Ustredni Vybor Komunisticke Strany Ceskoslovenska). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

The building of nuclear power complexes in Czechoslovakia requires the solution of outstanding technical, organizational and personnel problems. These complexes will become part of the environment for several decades and should therefore contribute to its improvement. The construction of nuclear power plants in Czechoslovakia is linked to that of the other socialist countries which are CMEA members. Space for the further development of nuclear power may be attained on the basis of socialist social relations.

59640 (INIS-mf—7092, pp v) **World-wide trend of nuclear power development.** Neumann, J. (Ceskoslovenska Komise pro Atomovou Energii, Prague). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

A survey is given of world consumption of primary energy in the years 1955 to 1975. The main components are crude oil and gas. The consumption of primary energy resources influences the

national product. A survey is given of the distribution of the fallout of ash and sulphur dioxide on the territory of Czechoslovakia. The main cause of the high fallout is the burning of brown coal. The radiation doses are analysed which man absorbs from various natural sources. The doses from the operation of nuclear power plants are negligible as compared with those from other sources. The complex fuel cycle according to the given diagram is only feasible for Czechoslovakia within the framework of the CMEA integrated program. A diagrammatic description is given of light water reactors of the WWER type and of fast reactor BM 600 including their operating safety.

59641 (INIS-mf—7092, pp v) **Nuclear power and development of economy and society.** Houdek, K. (Statni Planovaci Komise, Prague (Czechoslovakia)). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

The analysis of the energy situation in Czechoslovakia shows that the sole resource for the development of the Czechoslovak power base for the future is nuclear power and the increased import of natural gas. The development of nuclear power is the economically most advantageous alternative to the development of the production of electric power. Brown coal will keep its significant position and in 1990 will be used for the production of 30% of the total energy generated in this country and in 2000 for about 20%. The consumption of liquid fuels will remain at the present level. A significant role will have to be played by reducing the power demand of the Czechoslovak national economy. (Ha).

59642 (INIS-mf—7092, pp v) **Human factor in the process of nuclear power development.** Enenkl, V. (Vysoke Uceni Technicke, Brno (Czechoslovakia)). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

The building up of nuclear power requires the training not only of personnel but of the whole population as well. Professional workers in nuclear power facilities production and personnel operating the equipment of nuclear power plants must be on a high technical and managerial level. The important quality of such personnel is their reliability and responsibility. The human factor influences the level, quality and thereby also the service-life of the machines and equipment and their operation. The improvement of the quality of work in nuclear power production depends on upgrading the scientific and technical level of workers and personnel, their training, in-service education and the raising of the social standing.

59643 (INIS-mf—7092, pp v) **Development of nuclear power in Czechoslovakia.** Votruba, J. (Federalni Ministerstvo Paliv a Energetiky, Prague (Czechoslovakia)). 1979. (In Czech). Dep. NTIS (US Sales Only).

From Conference on nuclear power and the environment; Zdar nad Sazavou, Czechoslovakia (2 Apr 1979).

The programme is presented of the construction of nuclear power plants up to 1990 and prospects up to 1995. The localities and reactor types are given. For newly built power plants of the WWER 440 type the so-called V-213 project of a bubble-tray type pressure suppression system will be implemented while reactors of the WWER 1000 type (to be constructed at the end of the 1980's) will be provided with a containment building.

2907 Transport And Storage

REFER ALSO TO CITATION(S) 59272

2910 Conservation

REFER ALSO TO CITATION(S) 59185, 59672, 59683, 59684

2920 Supply, Demand, And Forecasting

59644 **(EUR—7692-EN) Medium-term energy-demand studies and model improvements. Final report.** (Cambridge Econometrics Ltd. (UK)). 1982. 182p. CEC, Information Market and Innovation, Luxembourg.

This final report covers case studies and improvements to the European Communities Energy Systems Modelling System. The report is made up of the following four sections: case studies and model improvements for the Netherlands; case studies for France; case studies for the United Kingdom; and model improvements. The implementation and development of the European Communities (EC) medium term energy modelling systems for the Netherlands, France, and the United Kingdom are described. The structure of the models and case studies used to test them are outlined. The results of the case studies are also described and compared with internal Dutch, French, and British forecasts where this is possible. Finally, in light of the results of the case studies further improvements to the medium term model structures are discussed. Research on improved models of energy demand included studies on disaggregated import functions, long run/short run elasticities for total energy demand, and different mechanisms for taking account of dynamic effects in simultaneous fuel substitution models.

59645 **(SERI/TR—211-1669) Analysis of Air Force base energy acquisition through third-party contracts.** Sklar, H.; Noun, R. (Solar Energy Research Inst., Golden, CO (USA)). Jul 1982. Contract AC02-77CH00178. 51p. NTIS, PC A04/MF A01. Order Number DE82020419.

A new class of utility service contracts is examined for supplying energy to Air Force bases under which the Air Force agrees to purchase energy and the contractor agrees to finance, design, construct, operate, and maintain a dedicated power plant. Such agreements are often referred to as third-party contracts. Third-party contracting issues are identified and analyzed and background is provided for Air Force personnel considering or negotiating third-party contracts. Economic incentives available to contractors are explained, an overview of third-party contracting is presented and specific issues discussed. Current military activities and plans are summarized. A case study of an Air Force Academy project is presented. It is concluded that third-party contracting will require a different approach to energy procurement and that the opportunity should exist for a successful contractor to realize a reasonable return on his investment. Items for inclusion in contracts, topics for further study, and Air Force actions to encourage third-party contracting are recommended.

59646 **(UT/CES-PS—18) Energy strategies of Western Europe in the 1980s: dependable supplies versus security implications.** Hoffman, G.W. (Texas Univ., Austin (USA). Center for Energy Studies). Jul 1982. 134p. NTIS, PC A07/MF A01. Order Number DE82021529.

The basic aim of this study is to emphasize the various strategies available to the countries of Western Europe when dealing with problems connected with their energy dependence and their effort to secure dependable supplies. The first part of the study focuses on the historical trends and the nature and extent of the energy problems in Western Europe since 1973. The various alternative strategies available for securing more dependable energy supplies for the Western European countries are analyzed in the second part. The last part of this study analyzes the problem of securing dependable energy supplies and their various security implications. Special attention is given to motives of the Soviet Union in proposing the natural gas pipeline project and those of the West European countries in accepting sizeable increases in their gas imports from the Soviet Union. Special attention is given to the concern voiced by the United States for the impact of Soviet gas deliveries to the NATO alliance. These discussions emphasize issues affecting both the economic security and political autonomy of the West European countries and the future alternatives available to them. (PSB)

59647 **Energy crisis of 1981: does it exist.** pp 27-41 of Energy policy in perspective - solutions, problems, and prospects. Spurr, S.H. (ed.). Austin, TX; University of Texas (1982).

From Energy policy in perspective - solutions, problems, and prospects symposium; Austin, TX, USA (12 Feb 1981).

The panel discusses the reality of the petroleum shortage and how to guard against an energy crisis by storing petroleum and seeking alternative sources. (PSB)

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 59631, 59656, 60198, 60199, 60200, 60201

59648 **(USGS-OFR—81-1257) Permit requirements for development of energy and other selected natural resources for the State of Illinois.** Jones, W.W. (ed.). (Indiana Univ., Bloomington (USA). School of Public and Environmental Affairs). Sep 1981. 68p. Geological Survey, Open-File Services Section, Box 25425, Denver Federal Center, Denver, CO 80225.

This guidebook summarizes environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook is intended not only for private developers and interest groups, but also for regulatory officials of Federal, State, and local government as well. The guidebook is divided into seven sections: Introductory Information; Consolidated Permit Programs, Local Regulatory Policies; Resource Extraction; Land Use Regulation; Environmental Quality Management; and Social/Ecological Preservation. Each section is divided into chapters; each chapter summarizes one permit, license, or approval. Permits administered by a single agency are generally grouped together in each section. (PSB)

59649 **(USGS-OFR—81-1259) Permit requirements for development of energy and other selected natural resources for the State of Kansas.** Forrest, A.S. (Radian Corp., Austin, TX (USA)). Jul 1981. 91p. Geological Survey, Open-File Services Section, Box 25425, Denver Federal Center, Denver, CO 80225.

This guidebook summarizes environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook is intended not only for private developers and interest groups, but also for regulatory officials of Federal, State, and local government as well. The guidebook is divided into seven sections: Introductory Information; Consolidated Permit Programs, Local Regulatory Policies; Resource Extraction; Land Use Regulation; Environmental Quality Management; and Social/Ecological Preservation. Each section is divided into chapters; each chapter summarizes one permit, license, or approval. Permits administered by a single agency are generally grouped together in each section. (PSB)

59650 **(USGS-OFR—81-1261) Permit requirements for development of energy and other selected natural resources for the State of Louisiana.** Carow, J.S. (Radian Corp., Austin, TX (USA)). Jul 1981. 80p. Geological Survey, Open-File Services Section, Box 25425, Denver Federal Center, Denver, CO 80225.

This guidebook summarizes environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook is intended not only for private developers and interest groups, but also for regulatory officials of Federal, State, and local government as well. The guidebook is divided into seven sections: Introductory Information; Consolidated Permit Programs, Local Regulatory Policies; Resource Extraction; Land Use Regulation; Environmental Quality Management; and Social/Ecological Preservation. Each section is divided into chapters; each chapter summarizes one permit, license, or approval. Permits administered by a single agency are generally grouped together in each section. (PSB)

59651 **(USGS-OFR—81-1262) Permit requirements for development of energy and other selected natural resources for the State of Maryland.** Lawson, B. (Lawson (Barry) Associates, Inc., Boston, MA (USA)). Sep 1981. 60p. Geological Survey, Open-File Services Section, Box 25425, Denver Federal Center, Denver, CO 80225.

This guidebook summarizes environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook is intended not only for private developers and interest groups, but also for regulatory officials of Federal, State, and local government as well. The guidebook is divided into seven sections: Introductory Information; Consolidated Permit Programs, Local Regulatory Policies; Resource Extraction; Land Use Regulation; Environmental Quality Management; and Social/Ecological Preservation. Each section is divided into chapters; each chapter summarizes one permit, license, or approval. Permits administered by a single agency are generally grouped together in each section. (PSB)

59652 **(USGS-OFR—81-1266) Permit requirements for development of energy and other selected natural resources for the State of Mississippi.** (Lawson (Barry) Associates, Inc., Boston, MA (USA)). Sep 1981. 73p. Geological Survey, Open-File Services Section, Box 25425, Denver Federal Center, Denver, CO 80225.

This guidebook summarizes environmental and land-use permits issued by the State for the development of energy and other natural resources. The guidebook is intended not only for private developers and interest groups, but also for regulatory officials of Federal, State, and local government as well. The guidebook is divided into seven sections: Introductory Information; Consolidated Permit Programs, Local Regulatory Policies; Resource Extraction; Land Use Regulation; Environmental Quality Management; and Social/Ecological Preservation. Each section is divided into chapters; each chapter summarizes one permit, license, or approval. Permits administered by a single agency are generally grouped together in each section. (PSB)

59653 **Energy policy in perspective - solutions, problems, and prospects.** Spurr, S.H. (ed.). Austin, TX; University of Texas (1982). 71p. (CONF-810286—). University of Texas at Austin, Lyndon B. Johnson School of Public Affairs, Austin, TX 78712.

From Energy policy in perspective - solutions, problems, and prospects symposium; Austin, TX, USA (12 Feb 1981).

Individual panel discussions are included in the database. (PSB)

59654 **History of energy policy development.** pp 1-26 of Energy policy in perspective - solutions, problems, and prospects. Spurr, S.H. (ed.). Austin, TX; University of Texas (1982).

From Energy policy in perspective - solutions, problems, and prospects symposium; Austin, TX, USA (12 Feb 1981).

The national energy policy is reviewed by a panel through the Roosevelt, Truman, Eisenhower, Kennedy, Johnson, Nixon, Ford, and Carter administrations. (PSB)

59655 **Energy policy for the 1980s.** pp 43-63 of Energy policy in perspective - solutions, problems, and prospects. Spurr, S.H. (ed.). Austin, TX; University of Texas (1982).

From Energy policy in perspective - solutions, problems, and prospects symposium; Austin, TX, USA (12 Feb 1981).

This panel looks at various facets and aspects of energy policy trying to agree on long-term objectives for technological development and economic considerations. (PSB)

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 59156, 59157, 59157, 59185

59656 **(DOE/EV/10286—3) Federal and state environmental regulatory requirements impacting synthetic fuels development.** (Hart (Fred C.) Associates, Inc., New York (USA)). Sep 1979. Contract AC02-79EV10286. 75p. NTIS (US Sales Only). Order Number DE82021803.

Portions of document are illegible.

The development of a viable synfuels industry - coal liquefaction, coal gasification and oil shale - is one of the goals of the President's recently announced energy policy. The expeditious licensing of synfuels facilities will be critical to the development of a National synfuels capability. The purpose of this effort, therefore, was to examine state and Federal environmental regulatory programs and to develop charts showing the requirements and procedures necessary to obtain permits and/or licenses for a synfuels facility. This report was based upon an interpretive review of Federal and state environmental legislation and regulations. The regulatory programs delineated include those established by the Federal government under the Clean Air Act (CAA), Clean Water Act (CWA) and Surface Mining Control and Reclamation Act (SMCRA) and those established under state laws for siting, water appropriations, surface mining and solid waste disposal. Six states were identified for study: Wyoming, Montana, Colorado, North Dakota, Kentucky and Illinois.

59657 **(MTP—80W00010) Summary of the second Western Hemisphere Energy Symposium, Rio de Janeiro, Brazil.** Pastor, M.M.; Cady, A.; Wagner, D. (comps.). (Mitre Corp., McLean, VA (USA). METREK Div.). 1981. 174p. (CONF-8009280—Summ.). Inter-American Development Bank, Publications-808 17th Street, NW, Washington, DC 20577.

From 2. western hemisphere energy symposium; Rio de Janeiro, Brazil (22 Sep 1980).

This energy symposium held sessions on: petroleum and natural gas; biomass; hydroelectric power; alternative energy sources; and the impact of the energy situation on the hemisphere's economy. Summaries of each session and abstracts of individual papers are included in this volume. (LCL)

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 59707

2960 Electric Power

REFER ALSO TO CITATION(S) 59657

59658 **(DOE/EIA—0356/1) Projected costs of electricity from nuclear and coal-fired power plants. Volume 1.** Reynolds, A. (Department of Energy, Washington, DC (USA). Energy Information Administration). Aug 1982. 69p. NTIS, PC A04/MF A01. Order Number DE82021751.

The relative economic merit of nuclear versus coal-fired electricity generation for new plants beginning baseload service in 1995 is discussed. The year 1995 is a focal point because it roughly coincides with the time horizon required to bring a new nuclear plant into operation, starting with an initial investment decision today. It is assumed that nuclear and coal-fired generating plants represent the most coal-effective options for baseload service in the foreseeable future. Either option is expected to produce baseload power for one-half to one-third of the marginal running costs of operating existing oil- and gas-fired plants in the future. Comparative levelized bus-bar costs are projected for the ten standard federal regions of the United States in order to accommodate regional differences in labor and material costs, coal characteristics, and transportation distances and costs. Further, the major factors that affect coal and nuclear generation costs - licensing and construction lead-times, vintages of technology, cost of financing, and reliability - are investigated with a set of consistent underlying assumptions. The results show that nuclear power is projected to have at least a 5% cost advantage in the New England and South Atlantic regions, due primarily to the distance of these regions from major coal fields. On the other hand, the North Central and Southwest regions contain major coal fields and thus coal-fired plants are projected to have costs well below nuclear plants. For the rest of the nation, coal-fired and nuclear generation costs are projected to be within 5% of each other. This volume of the 2-volume report is on executive summary of the results.

59659 **(DOE/NBM—2021575) Alaska electric-power statistics, 1960-1981. Seventh edition.** (USDOE Alaska Power Administration, Juneau). Aug 1982. 51p. NTIS, PC A04/MF A01. Order Number DE82021575.

Portions of document are illegible.

This is the seventh in a series of statewide electric power data summaries compiled by the Alaska Power Administration (APA). It continues the efforts by APA to provide a convenient and current reference source on Alaska power system data and trends in statewide electric power use. Statistics are included for: installed generating capacity; percentage of various types of prime mover in the total generating capacity; annual growth in generating capacity; net energy generated; residential, commercial, and industrial power demand; peak loads, typical residential electric bills; and the location of existing transmission systems. (LCL)

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 59630, 59646

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 59354, 59356, 59358, 59374, 59414, 59439, 59440, 59441, 59645, 59657

59660 **(DOE/EA—0163) New Energy Corporation of Indiana: loan-guarantee application.** (Department of Energy, Washington, DC (USA)). Apr 1982. 59p. NTIS, PC A04/MF A01. Order Number DE82016077.

The scope of this environment assessment is project- and site-specific. Section 2 describes the project proposed for loan guarantee and the alternatives considered by the applicant. In addition, the alternative of not awarding the loan guarantee (no action alternative) is considered. Section 3 describes the environmental setting of the proposed project, and Section 4 provides an assessment of the impact of the proposed project on the affected environment.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

59661 **(DOE/ET/10815—66) Microscopic examination of electrode surfaces after Avco's sulfur test 6. Interim report.** Brosnan, D.A. (Tennessee Univ., Tullahoma (USA). Space Inst.). Dec 1981. Contract AC02-79ET10815. 32p. NTIS, PC A03/MF A01. Order Number DE82016915.

Electrode specimens were obtained from Avco-Everett Research Laboratory on August 25, 1980, after service in the Mark VII MHD channel during sulfur test No. 6 in which 115 thermal and 92 power hours were accumulated. These electrodes were anode numbers 39 and 44, which were fabricated with a wear resistant leading edge of a platinum bar shape brazed in place with a stainless steel RA 26-1 strip brazed over copper forming the remainder of the electrode surface. In the case of electrode 39, the leading edge was a platinum bar, 3.175 mm wide x 3.175 mm thick, extending across the anode length with the stainless strip of dimensions 12.700 mm wide x 3.175 mm thick brazed onto the copper supporting block. Anode 44 consisted of a platinum slag cup on the leading edge fabricated from strip 0.508 mm thick with the stainless strip of dimensions 9.525 mm wide x 3.175 mm thick brazed over copper. The experiments at Avco have been aimed at measuring wear rates of various electrode metals as a function of key generator operating variables including plasma composition, current carried by individual electrodes, surface temperature, etc. The experiments in sulfur test 6 were designed to yield information on the effect of plasma sulfur content on the stainless cladding materials and provide further electrode design information, etc. The purpose of this investigation was to determine the mechanism of wear of the anodes using both optical and scanning electron microscopic (SEM) techniques. These results will provide Avco with supporting infor-

mation on materials selection, and the information from this study could be used for materials selection for generator service at The University of Tennessee Space Institute (UTSI) in the Coal-Fired Flow Facility (CFFF). Results are reported.

59662 **(DOE/ET/10815—70) Three-dimensional current distribution in coal-fired MHD channels.** Ishikawa, M.; Wu, Y.C.L.; Scott, M.H. (Tennessee Univ., Tullahoma (USA). Space Inst.). Jan 1982. Contract AC02-79ET10815. 64p. NTIS, PC A04/MF A01. Order Number DE82016958.

Slagging effects on theoretical three dimensional current and potential distributions are presented for one frame of the UTSI 60°DCW channel. The electrodynamic problem is solved with imposed gasdynamic and slag layer solutions. A three-dimensional finite element method is applied to solve for the electrical potential. The location of current concentration calculated on anode sidebar wall coincides with wear pattern observed in experiments. Without considering slag polarization, the leakage resistance calculated lies between 5 to 7 Ω, which gives the upper bound of slag layer leakage resistance. Next, the effects of slag polarization on electrodes and the sidewall configuration on generator performance are investigated experimentally and analytically in the UTSI channel. An analysis of the voltage-current characteristics between two generator frames measured during the operation of the TP40-07 experiment is presented along with the examination of nonuniformities of interframe voltage. Experimental data reveals that the polarization effect reduces about three percent of the overall electrical performance of the UTSI 60° Diagonal Conducting Wall (DCW) channel. A moderate increase of conductivity in the vicinity near the cathode-side frame gives a calculated leakage resistance which approximates the value derived experimentally. The polarization effect results in a large change of the potential and current distributions near the frame but has a small effect on the overall electrical performance. Alternate sidewall/electrode configurations are considered analytically.

59663 **(DOE/ET/10815—73) MHD coal-fired flow facility. Quarterly technical progress report, April - June 1981.** Altstatt, M.C.; Attig, R.C.; Brosnan, D.A. (Tennessee Univ., Tullahoma (USA). Space Inst.). Sep 1981. Contract AC02-79ET10815. 64p. NTIS, PC A04/MF A01. Order Number DE82019832.

Portions of document are illegible.

The University of Tennessee Space Institute (UTSI) reports on significant activity, task status, planned research, testing, and development for the Magnetohydrodynamics (MHD) Coal-Fired Flow Facility (CFFF) and the Energy Conversion Facility (ECF). Under task 1, work was completed on the holding ponds, extension of the stack platform, the shelter for the demineralized water system and the Low Mass Flow Quench System. On Task 2 Shakedown testing continued on the Low Mass Flow Train, consisting of vitiation heater, combustor, nozzle, replacement duct, diffuser, radiant furnace and secondary combustor. Under Task 3, laboratories are functioning to support both ECF and CFFF testing as well as environmental requirements. Negotiations with MERDI to supply a third monitoring trailer and instruments for CFFF were finalized. For Task 4, the CFFF shakedown is continued. No major problems have been found. Under task 7, the LDV system in the cold flow facility is now fully operational. Numerical modeling of isothermal combustor flows has been finished. (WHK)

59664 **(DOE/ET/15529—8) MHD electrode development. Quarterly report, July-September 30, 1980.** Sadler, J.W.; Cadoff, L.H.; Dietrick, D.L. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). Nov 1980. Contract AC01-79ET15529. 96p. NTIS, PC A05/MF A01. Order Number DE82021828.

Portions of document are illegible.

Emphasis within this program is being directed toward the engineering development of cold metallic electrodes, and in particular the identification and evaluation of alternatives to platinum for use as an anode clad materials. As a follow-up to the previously completed literature search, specific materials have been identified for investigation within this program. In addition, the general content and program methodology are described. Laboratory anode arc erosion studies have continued. Results of continuing tests are presented. Improvements in test methodology have been defined. As a result a standardized procedure has been established which has provided the required test reproducibility and discrimination between materials. WESTF test operations were suspended upon completion of WESTF Test 49 in March 1980. The primary facility modification, addition of a conventional 3 Tesla magnet, has been completed. As part of this basic modification, a number of other improvements have been made to the facility. Details applicable to facility activation are presented. Test planning activities in support of the initial WESTF tests have been completed and are reported.

59665 **MHD electrical power generation.** Marchant, D.D.; Lytle, J.M. (to Dept. of Energy, Washington, DC (USA)). British Patent 2,081,984/A/. 24 Feb 1982. 8p.

An MHD power generation system is described in which energy from the MHD effluent is utilized to increase system efficiency.

59666 **Open-cycle magnetohydrodynamic power plant based upon direct-contact closed-loop high-temperature heat exchanger.** Berry, G.F.; Minkov, V.; Petrick, M. (to Dept. of Energy). US Patent Application 317,701. 2 Nov 1981. 28p. Contract W-31-109-ENG-38.

A magnetohydrodynamic (MHD) power generating system is described in which ionized combustion gases with slag and seed are discharged from an MHD combustor and pressurized high temperature inlet air is introduced into the combustor for supporting fuel combustion at high temperatures necessary to ionize the combustion gases, and including a heat exchanger in the form of a continuous loop with a circulating heat transfer liquid such as copper oxide. The heat exchanger has an upper horizontal channel for providing direct contact between the heat transfer liquid and the combustion gases to cool the gases and condense the slag which thereupon floats on the heat transfer liquid and can be removed from the channel, and a lower horizontal channel for providing direct contact between the heat transfer liquid and pressurized air for preheating the inlet air. The system further includes a seed separator downstream of the heat exchanger.

3005 Fuel Cells

59667 **(DOE/NASA/12726—16) Design flexibility of Redox flow systems.** Hagedorn, N.H.; Thaller, L.H. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1982. Contract AI04-80AL12726. 17p. (NASA-TM—82854; CONF-820814—21). NTIS, PC A02/MF A01. Order Number DE82020785.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

The characteristics inherent in Redox flow systems permit considerable latitude in designing systems for specific storage applications. The first of these characteristics is the absence of plating/deplating reactions with their attendant morphology changes at the electrodes. The second characteristic is the separation of power generating components (stacks) from the energy storage components (tanks). The final characteristic is the commonality of the reactant fluids which assures that all cells at all times are receiving reactants at the same state-of-charge. Consideration is given to a number of applications, each of which takes advantage of one or more of the inherent characteristics of Redox flow systems. These various applications span a spectrum of power and energy requirements from small, uninterruptable power supplies, through standalone photovoltaic and wind sites to electric utility central stations. Finally, an update on the status of the NASA Lewis Redox system technology will be provided, focusing upon electrode and membrane developments and system cost projections.

59668 **(PB—82-195637) Metal chelate catalysts for fuel cells. Annual report Jul 80-Jun 81.** Darby, R.; White, R.; Yamana, M.; Tsutsui, M. (Texas A and M Univ., College Station (USA)). Jul 1981. 34p. NTIS, PC A03/MF A01.

A variety of metal chelates were synthesized and evaluated for their activity as oxygen cathode electrocatalysts in strong acidic electrolytes. It was found that cobalt tetraazaanulene (CoTAA) and iron phthalocyanine (FePc) exhibit the best activity of all the metal chelates synthesized, but have very limited stability. The proposed

solution to this problem is the synthesis of polymeric forms of these chelates, with comparable active and considerably greater stability than the monomers. Three methods for stability testing were developed: (1) Potentiostatic, with periodic measurement of the current potential characteristic; (2) potentiostatic, with continuous monitoring of the current, and; (3) galvanostatic, with continuous monitoring of potential. Each method provides a good evaluation of activity versus time, and the method to be used depends upon the objective of the test. A polymeric form of Co(TAA) was synthesized by means of an acetylene terminated monomer, which in turn was made via a $Co(TAA)Br_2$ intermediate. The activity of the polymer was found to be comparable to that of Co(TAA) monomer, and significantly greater than that of either the stacked or sheet polymeric forms of cobalt tetraphenylporphrine (CoTPP) previously synthesized and tested.

59669 **(PB—82-200676) Internal reforming for natural gas fueled molten carbonate fuel cells. Final report 1 May 80-30 Jun 81.** Baker, B.; Burns, D.; Lee, C.; Maru, H.; Patel, P. (Energy Research Corp., Danbury, CT (USA)). Dec 1981. 107p. NTIS, PC A06/MF A01.

A natural gas fueled molten carbonate fuel cell (MCFC) is an attractive system for efficient electricity generation. The system yields maximum efficiency while operating on internal reforming mode. Among the various configurations evaluated for internal reforming MCFC, direct internal reforming appears to be most promising. Compared to the conventional baseline external reformer system, it can save as much as 20% natural gas at reduced capital and operating costs. The feasibility of internal reforming in MCFC has been verified through laboratory-scale (10 sq cm) cell tests followed by a successful scale-up to bench-scale (300 sq cm) cell. Bench-scale cells have been operated with direct methane feed up to 2000 hours. The results of system analysis and experimental work show that a successful development of the internal reforming MCFC will result in significant savings of natural gas and a cost effective electricity generation.

59670 **Pt/Pd electrocatalyst electrons for fuel cells.** Stonehart, P. (to Dept. of Energy). US Patent Application 317,818. 3 Nov 1981. 15p. Contract AI01-80ET17088.

This invention relates to improved electrochemical cells and to novel electrodes for use therein. In particular, the present invention comprises a fuel cell used primarily for the consumption of impure hydrogen fuels containing carbon monoxide or carbonaceous fuels where the electrode in contact with the fuel is not substantially poisoned by carbon monoxide. The anode of the fuel cell comprises a Pd/Pt alloy supported on a graphitized or partially graphitized carbon material. Fuel cells which comprise as essential elements a fuel electrode, an oxidizing electrode, and an electrolyte between said electrodes are devices for the direct production of electricity through the electrochemical combustion of a fuel and oxidant. These devices are recognized for their high efficiency as energy conversion units, since unlike conventional combustion engines, they are not subject to the limitations of the Carnot heat cycle. It is the primary object of the present invention to provide an electrode having high electrochemical activity for an electrochemical cell. It is another object of the present invention to provide an electrode having an electro-catalyst which is highly resistant to the corrosive environment of an electrochemical cell.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

REFER ALSO TO CITATION(S) 59173, 59185, 59358, 59383, 59384, 59385, 59386, 59619, 59620, 59623

59671 **(AD-A—112649/9) Investigation of single versus dual-hot and cold building water systems. Final report 1 Sep 80-15 Oct 81.** Bruce, P.B.; Ramsey, M.S.; Shepherd, P.B. (Johns-Manville Sales Corp., Denver, CO (USA). Research and Development Center). 15 Oct 1981. 513p. NTIS, PC A22/MF A01.

Reduction of lavatory hot water temperature to tepid (105 deg F) and elimination of cold water faucets may, in some instances, offer a cost effective means for energy conservation. A manual calculation method has been derived from a computer simulation of water systems. This will permit the reader to quickly and easily evaluate his own water system. The mathematical model used for the simulation confirmed three highly effective low/no cost actions for energy conservation in all hot water systems: install a flow restrictor in all hot water taps; apply an insulation blanket to the outside of central water heats, and reduce water temperature to the lowest permissible level.

59672 **(AD-A—112664/8) Premium for energy savings investment study. Technical publication Jul 76-Apr 77.** Kappelman, E.E. (Naval Weapons Center, China Lake, CA (USA)). May 1978. 34p. (NWC-TP—5960). NTIS, PC A03/MF A01.

A study was conducted to determine the premium that should be allowed for energy saving construction at Naval facilities. A number of options or 'strategies' were identified that could be pursued in order to establish this premium. The advantages and disadvantages of each were detailed and the preferred strategy was recommended.

59673 **(BNL—51555) Field tests of refit equipment for residential oil-fired heating systems.** Hoppe, R.J.; Graves, W.L. (Brookhaven National Lab., Upton, NY (USA)). Apr 1982. Contract AC02-76CH00016. 36p. NTIS, PC A03/MF A01. Order Number DE82020577.

An energy conservation study of residential fuel oil savings obtained by the refit of existing boilers and furnaces was made by a one-year field test of 250 detached houses in a 5500 annual heating degree day climate. Retention-head burners properly installed on boilers produced savings of 18%; the addition of vent dampers or boiler temperature programmers to these systems yielded little increase in savings. With boilers using conventional burners, a controls package consisting of a double setback clock thermostat plus a boiler temperature programmer produced fuel savings of 19% in homes unoccupied during the day. With conventional burners the use of vent dampers, flue heat exchangers, or double setback thermostats produced typical savings of 10%. Retention-head burners yield 11% fuel savings with furnaces. The addition of vent dampers produced no further savings. For use in this project, a low cost method of calculating the annual fuel use in a building was developed that corrected for annual weather changes and for fuel use in heating domestic hot water. The data required were daily mean temperatures and fuel delivery dates and quantities; no instrumentation was used. The fuel use of thirty identical houses was traced through the periods of rapid oil price increases between 1977 and 1980; mean fuel use decreased each season but at a decreasing rate.

59674 **(CONF-820814—28) Earth thermal storage for enhanced performance of air-to-air heat pumps.** Ternes, M.P. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 13p. NTIS, PC A03/MF A01. Order Number DE82020773.

From 17. Intersociety Energy Conversion Engineering conference; Los Angeles, CA, USA (8 Aug 1982).

The heat that exists naturally in the earth under a house with a crawl space may be used in the winter months to preheat the source air of an air-to-air heat pump and, thereby, bring about improvements in the efficiency of the heat pump. The source air is warmed by drawing it through the crawl space where it gains heat from the warmer earth. This allows the heat pump to operate in a climate more favorable than ambient. In the past winter, a comprehensive, comparative test of the concept was begun. This test involves three identical unoccupied houses in the Knoxville area, two of which have been configured to use the crawl space but in a different manner for each. The third house has a standard heat pump installation and serves as the control for the experiment. The houses were highly instrumented in order to determine the net benefit of the concept. Results from the experiment for the past winter showed that dramatic improvements in the heat pump performance were obtained during mid-winter conditions. However, anomalies which were encountered during this testing period have precluded

definitive conclusions. Additional work is being performed so that indisputable recommendations can be made.

59675 **(CONF-820827—6) Earth thermal-storage-assisted heat pump.** Ternes, M.P. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020823.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The earth under a house with a crawl space may be used to thermally condition the source air of an air-to-air heat pump during the winter as well as the summer. This allows the heat pump to operate in a temperature climate more favorable than ambient and, thus, at a higher efficiency. During this reporting period, a comprehensive, comparative test involving three unoccupied houses was begun to determine the net benefit of this concept. Results from the experiment for the past winter showed that dramatic improvements in the heat pump performance were obtained during midwinter conditions. Definitive conclusions cannot be made, however, because of the anomalies which were encountered. Summer data collection is currently underway, and no results are available at this time.

59676 **(CONF-820827—13) Heat-pump cool storage in a clathrate of freon.** Tomlinson, J.J. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020840.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

Presented are the analytical description and assessment of a unique heat pump/storage system in which the conventional evaporator of the vapor compression cycle is replaced by a highly efficient direct contact crystallizer. The thermal storage technique requires the formation of a refrigerant gas hydrate (a clathrate) and exploits an enthalpy of reaction comparable to the heat of fusion of ice. Additional system operational benefits include cool storage at the favorable temperatures of 4 to 7°C (40 to 45°F), and highly efficient heat transfer rates afforded by the direct contact mechanism. In addition, the experimental approach underway at ORNL to study such a system is discussed.

59677 **(CONF-820827—14) Evaluation of stratified thermal-storage system for Oliver Springs Elementary School.** Reid, R.L.; Bedinger, A.F.G. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA)). 1982. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE82020839.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

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The thermal storage system at the Oliver Springs Elementary School consists of three cast-in-place concrete water storage tanks, each approximately 2956 ft^3 and using a flexible membrane device to resist temperature blending. The membrane can float up and down to suit variable conditions. The design goals of the heat recovery and thermal energy storage are to minimize the need to purchase energy for space heating, cooling, and water heating and to minimize electrical demand. The system is described and the history of the project is briefly reviewed. The automatic data acquisition system and the data analysis are also briefly discussed. (LEW)

59678 **(CONF-820827—16) Performance of labyrinth-stratified water-storage system for heating and cooling.** Wildin, M.W. (Oak Ridge National Lab., TN (USA); New Mexico Univ., Albuquerque (USA). Dept. of Mechanical Engineering). 1982. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE82020817.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

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The feasibility of storing heating or cooling capacity in thermally-stratified water contained in rectangular concrete tanks has been demonstrated in this project. For the approximately cubical tanks, which were 4.6 meters deep, and for the flow rates which were employed in a diurnal charge-discharge cycle, thermoclines about three feet thick were routinely established during charging and discharging phases of an operating cycle. Initially, vertical internal partitions were installed in the tanks during construction to prevent direct streaming from inlet to outlet and to maximize the active fraction of storage volume. However, it was found that these partitions were unnecessary, and they leaked water, so they were eventually removed. Also, the original blunt inlet/outlets were replaced with linear diffusers designed to introduce water into the tanks and remove it at low velocity and with a relatively uniform distribution. These diffusers were located at diagonally opposite horizontal corners of a tank. Thermal efficiency was evaluated for periods long enough that changes in internal energy of storage could be neglected relative to total energy flow to and from storage. The efficiency realized from cooled storage was in the range from 80 to 90 percent, while that for heated storage was in the range from 65 to 81 percent with the most frequent value being near 70 percent. The higher efficiency of cooled storage is due to several factors, including lower temperature differences to produce energy flow across the boundaries, less internal mixing in storage when the partitions were present and shorter average residence times of energy in storage. Evaluation of the performance of cooled storage using tanks with no internal partitions was being performed in the 1982 summer cooling season.

59679 **(CONF-820827—17) Oak Ridge National Laboratory thermal-energy-storage program overview.** Martin, J.F. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01. Order Number DE82020818.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

Portions of document are illegible.

Oak Ridge National Laboratory is the lead technical laboratory for DOE in the areas of thermal-energy-storage technology development for building heating and cooling and industrial applications. The program of technical assessment and research and development is carried out in support of the national objective of energy conservation and development of new energy sources. The activities supported by this program in FY 1982 are described. The major thrust of next year's program is given.

59680 **(CONF-820849—2) Comparison of laboratory and field-test measurements of heat-pump water heaters.** Levins, W.P. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE82020810.

From Summer study in energy efficient buildings; Santa Cruz, CA, USA (22 Aug 1982).

Portions of document are illegible.

After developing the heat pump water heater (HPWH), a field-test plan was implemented whereby 20 US utilities each received five units for a one-year test period. During the field tests, two of the prototype HPWHs identical to the field-test units were tested in the laboratory. The experience proved extremely valuable in both realigning the field-test procedures and in analyzing the field-test data. A comparison of the laboratory and the field-test data was excellent on an overall basis but showed differences for parametric temperature sensitivities. Field-test data for the effect of the HPWH on the house heating system were not only overly conclusive, but laboratory test data were used to analytically evaluate this effect.

59681 **(DOE/CS/20376—1) Summary report of energy usage/consumption analysis for six hotels/motels.** (Hospitality, Lodging and Travel Research Foundation, New York (USA); Honeywell, Inc., Minneapolis, MN (USA). Technology Strategy Center; Energy Technical Center, San Antonio, TX (USA); Stewart (Sam) and Associates, St. Paul, MN (USA)). Dec 1981. Contract AC02-79CS20376. 184p. NTIS, PC A09/MF A01. Order Number DE82020791.

An analysis of energy consumption and energy use profiles for six hotels and motels of various types (transient, convention, resort) located in different geographical areas of the United States is summarized. Data include information collected at the six demonstration sites only during the heating and cooling seasons. Data show where the energy is used, how much is used and when it is used. A brief examination of strategies for reducing energy consumption is also included. Major hotel/motel functions are identi-

fied as: guest rooms, public areas, kitchens, dining areas, laundries, pools, elevators, and others. Energy use categories examined are: space heating, space cooling, domestic water heating, cooking, laundry dryers, lighting, HVAC auxiliaries, elevators, and others. The six hotels/motels are located in Vermont, Minnesota, Arizona, Georgia, and two in Texas. The building configuration, facilities, energy-using systems, and climatic conditions are described for each site. (LEW)

59682 **(LBL—13100) Residential air-leakage and indoor air quality in Rochester, New York.** Offermann, F.J.; Dickinson, J.B.; Fisk, W.J.; Grimsrud, D.T.; Hollowell, C.D.; Krinkel, D.L.; Roseme, G.D. (Lawrence Berkeley Lab., CA (USA); R.I.T. Research Corp., Rochester, NY (USA)). Jun 1982. Contract AC03-76SF00098. 106p. NTIS, PC A06/MF A01. Order Number DE82020640.

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A sample of 58 occupied homes in Rochester, New York, most of which incorporated special builder-designed weatherization components, were studied to assess (1) the effectiveness of construction techniques designed to reduce air leakage; (2) the indoor air quality and air-exchange rates in selected tight houses, and (3) the impact on indoor air quality of mechanical ventilation systems employing air-to-air heat exchangers. The specific leakage area was measured in each house using the fan pressurization technique. Houses built with polyethylene vapor barriers and joint-sealing were as a group 50% tighter and had a 30% lower overall average heat loss coefficient ($W/°C\text{-}m^2$) than a similar group of houses without such components. Mechanical ventilation systems with air-to-air heat exchangers were installed in nine relatively tight houses, some of which had gas stoves and/or tobacco smoking occupants. Air-exchange rates and indoor concentrations of radon (Rn), formaldehyde (HCHO), nitrogen dioxide (NO_2), and humidity were measured in each house for one-week periods with and without mechanical ventilation. More detailed measurements including concentrations of carbon monoxide, and inhalable particulates were made in two of these houses by a mobile laboratory. In all nine houses, air-exchange rates were relatively low without mechanical ventilation, 0.2 to 0.5 ach, and yet indoor concentrations of Rn, HCHO, and NO_2 were below existing guidelines. Mechanical ventilation systems were effective in increasing air-exchange rates and in further reducing indoor contaminant concentrations. The average sensible effectiveness of the heat exchangers was 0.65 +- 0.16. We conclude that when contaminant source strengths are low, acceptable indoor air quality can be compatible with low air-exchange rates.

59683 **(LBL—14734) Result of recent weatherization retrofit projects.** Dickinson, J.B.; Lipschutz, R.D.; O'Regan, B.; Wagner, B.S. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 21p. (CONF-820849—1). NTIS, PC A02/MF A01. Order Number DE82020313.

From Summer study in energy efficient buildings; Santa Cruz, CA, USA (22 Aug 1982).

Pacific Gas and Electric (PG and E) and the Bonneville Power Administration (BPA) have conducted studies in their respective service areas in order to evaluate the cost-effectiveness of certain conservation retrofits. Twenty houses in Walnut Creek, California, underwent an infiltration reduction program, similar to house doctoring. Ten of these houses also received additional contractor-installed measures. BPA retrofitted 18 houses at its Midway substation in central Washington. Retrofits made to the houses included: attic and crawlspace insulation, foundation sill caulking, storm windows and doors, increased attic ventilation, and infiltration reduction. Energy consumption and weather data were monitored before and after each set of retrofits in both projects. Leakage measurements were made by researchers from the Energy Efficient Buildings Program using blower door fan pressurization, thereby allowing calculation of heating season infiltration rates. An energy use model correlating energy consumption with outside temperature was developed in order to determine improvements to the thermal conductance of the building envelope as a result of the retrofits. Energy savings were calculated based on the results of the energy use model. As a check on these findings, the Computerized Instrumented Residential Audit (CIRA) load calculation program developed at Lawrence Berkeley Laboratory provided a theoretical estimate of the savings resulting from the retrofits. At Midway, storm windows and doors were found to save the most energy. Because the Midway houses were not very leaky at the beginning of the experiment, the infiltration reduction procedures were less effective than expected. In the Walnut Creek project, the infiltration reduction procedures did decrease the leakiness of the test houses, but the effect upon energy savings was not great.

59684 **(NP—2904708) Nebraska energy conservation plan for the Weatherization Assistance Program, April 1 to December 31, 1982.** (Nebraska Energy Office, Lincoln (USA)). 1982. 70p. NTIS, PC A04/MF A01. Order Number DE82904708.

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The State of Nebraska, Nebraska Energy Office, is applying to the United States Department of Energy for $1,869,831 in Weatherization Assistance funds. These funds will be used to assist low-income residents of Nebraska in the weatherization of their homes. Weatherization consists of implementing those measures, within a dollar limit of $1200 per home, which will make the dwelling more energy efficient. Typical measures include: insulation, caulking, weatherstripping, sealing and tightening of primary doors and windows and installation of storm windows. The Energy Office proposes to serve Nebraska residents who receive an income of 125% of the federally established poverty level for Nebraska, or below. Services will be delivered to these residents by public entities which are contracted to the Nebraska Energy Office for this purpose. Those entities are ten Community Action agencies and the Inter-tribal Development Corporation. The State assures that all federal mandates and requirements in regard to priorities, procedures and expenditures will be met. Public input to the attached plan, for the purpose of administering the Weatherization Program in Nebraska, was solicited from the Program Advisory Committee (PAC), from all Community Action Agencies in the State and from the general populace, through the use of a public hearing. Projections of dwellings to be weatherized, the percentage of those which fall into federally considered categories and the amount of energy to be conserved through the program are made and included.

59685 **(PB—82-199001) Space conditioning performance analysis and simulation study. Annual report Feb 80-Feb 81.** Patani, A.; Bonne, U. (Honeywell, Inc., Bloomington, MN (USA)). Jul 1981. 153p. NTIS, PC A08/MF A01.

Simulation models were developed and used for the analysis of the space conditioning systems discussed. The authors expanded the engine-driven heat pump model developed previously to incorporate a new approach for evaluating the influence of cycling and infiltration on the latent load and latent cooling effectiveness. Analysis of these systems included the sensitivity of performance to electric consumption, compressor speed, sizing and climate. A modular program for evaluating the steady state performance of absorption heat pumps was developed. Initial simulations indicated performance trends as a function of outdoor temperature and the refrigerant-absorber charge. The combustion heating system model, HFLAME, was used to simulate the benefits of fan/pump overrun and the dependence of corresponding setpoints on off-period losses and electric costs. Benefits of fuel, fuel/air modulation as compared to cyclic performance were also analyzed, incorporating recent experimental data and previously derived dependence of the temperature rise on excess air and fuel input. HFLAME was also used to analyze the seasonal efficiency of different direct venting methods, which were found to range from 61% (conventional) to 75% (balanced flue with inversion).

59686 **(PB—82-182866) Energy savings in the heating and hot water supply of blocks of flats by using a gas engine driven heat pump in monovalent operation at outside temperatures down to -12°C. Final report.** Heiburg, O. (Commission of the European Communities, Luxembourg). [nd]. 35p. (EUR—7133-DE). NTIS PC E03/MF E03.

Energy conservation is considered by use of a gas engine driven heat pump using outside air as heat source. A monovalent heat pump consisting of a reciprocating gas engine driving a reciprocating compressor supplies a dwelling house with 64 apartments with heat and hot water. Heat capacity is 465 kW at a temperature of -12C. First the gas engine was fueled with coke-oven gas containing 57.4% hydrogen and later on the type of gas was changed

to natural gas, which has resulted in a longer standing time of the elements of the gas engine. The heat pump system using R 22 as refrigerant had a real running time of about 2500 to 3000 hours/year. The installation operated monovalent up to -12C demonstrated in the frosting period 1978/79. Compared with conventional heating systems the energy conservation is about 50%. Under these conditions the pay back period is less than 10 years.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 59138, 59349, 59353, 59358, 59679

59687 **(AD-A—112329/8) Dehumidified air for drying single-base propellant. Final report Aug 79-Aug 81.** Garth, W.Y. (Hercules, Inc., Radford, VA (USA)). Feb 1982. 86p. NTIS, PC A05/MF A01.

The purpose of this project was to reduce the present expenditure of thermal energy during the drying of single-base propellant by using dehumidified heated air as the drying medium. Results of this study show that the use of dehumidified air for drying single-base propellant is neither cost nor energy efficient. However, the study does show that the installation of a plate type air-to-air heat exchanger between the exhaust and intake air streams will effect an annual energy savings of 679,000 kg (1,498,000 lb) of stream for a cost savings of approximately $6,400 per air dry unit/year.

59688 **(CONF-820860—1) Oil-seed penetration in the agricultural sector under alternative price assumptions for petroleum fuels.** Bjornstad, D.J.; Hillsman, E.L.; Tepel, R.C. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE82020835.

From International conference on plant and vegetable oils as fuels; Fargo, ND, USA (2 Aug 1982).

Portions of document are illegible.

The rate at which biomass fuels become cost-competitive as conventional fuel prices increase is examined. Fuel demands for ten farm operations in the year 1990 are projected and matched with biomass fuel substitutes from ten feedstocks and nine processes. Sixty-one feedstock/process combinations are available. This information is processed using a linear programming model to find a way to meet fuel demands at low cost. The model is solved for a series of conventional fuel real price increase holding costs of biomass fuel substitutes constant to determine the relative increases in conventional fuels necessary to bring about biomass fuel penetration. Two alternative assumptions are made about rates of biomass fuel penetration. The first assumption allows penetration to be limited by projected feedstock availability and construction lead times, while the second omits these limits to estimate maximum penetration rates. Results reported include the percent of total conventional fuel and individual conventional fuels for which biomass substitutes become cost-competitive under the range of conventional fuel prices, and detailed information about oilseed penetration.

59689 **(DOE/CS/40312—T1) Development of retrofitting modifications of textile loom picking and lay mechanisms for reduction of energy consumption. Final report (Phase I).** (Lowell Univ., MA (USA)). Jul 1982. Contract AC02-80CS40312. 59p. NTIS, PC A04/MF A01. Order Number DE82019482.

Portions of document are illegible.

Air jet looms are more energy efficient than conventional shuttle looms and can be run at higher speeds. But before any loom can be installed in a particular building, it is important to know the level of the dynamic loads which will be transmitted to the foundation. A reliable technique for measuring the dynamic loads is described, and the loads of an air jet loom are compared with the loads of a conventional shuttle loom. Test results show that the peak dynamic loads of the air jet loom are closely comparable to the loads of the shuttle loom. The test techniques attempt to measure the maximum dynamic load that the loom is capable of developing. Test experience shows that the actual loom loads depend to a minor degree on the state of the loom itself, and to a significant degree on the boundary (mounting) conditions. In particular, slippage at the loom mounting interface limits the dynamic load to the friction force. Since slippage was absent in the vertical direction, the actual vertical loads are nearly maximum. However, slippage was present in the horizontal direction, and the actual horizontal loads are less than the maximum possible loads.

59690 **(PB—82-200585) Industrial energy use. Volume I. Annual report. Final report Jul 79-Apr 81.** Lerner, M.O.; Sarin, A.; Kothari, V.S. (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). Jan 1982. 121p. NTIS, PC A06/MF A01.

The report gives results of a study covering seven major energy-intensive industries to identify areas with high potentials for improvement in the efficiency of industrial gas use. About 85 percent of all natural gas used in industrial process heaters is accounted for in the seven industries which are primary metals (iron and steel, aluminum), stone, clay and glass, petroleum, chemicals, food, textiles, and paper. The study proceeded in four major steps. In Step 1, the most recent industrial fuel use data was collected, checked, and disaggregated by process, furnace, and fuel type using five national energy consumption data bases. In Step 2, efficiency and heat distribution for 40 furnaces were determined using energy and material balances. Furnace models were developed to aid these computations and to evaluate energy recovery options for each of the major losses, e.g., flue and wall losses, combustion losses, etc. In Step 3, discussions were held with industry representatives to obtain feedback on the study's findings relating to current and future uses of alternate energy sources and promising conservation options which are available or under development. In Step 4, quantitative data on total energy use and typical furnace efficiency were incorporated with qualitative information on future fuel use trends, future changes in process/furnace mix, etc., to identify areas where maximum gains in energy efficiency could occur. The most promising conservation options were determined and research areas categorized as generic (not furnace-specific) and process-specific options.

59691 **(PB—82-200593) Industrial energy use. Volume II. Final report Jul 79-Apr 81.** Lerner, M.O.; Sarin, A.; Kothari, V.S. (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). Jan 1982. 285p. NTIS, PC A13/MF A01.

The report gives results of a study covering seven major energy-intensive industries to identify areas with high potential for improvement in the efficiency of industrial gas use. The industries studied include primary metals (iron and steel, aluminum); stone, clay, and glass; petroleum; chemicals; food; textiles; and paper.

59692 **(PNL—4362) Ten case-history studies of energy-efficiency improvements in pulp and paper mills. Final report.** (Battelle Pacific Northwest Labs., Richland, WA (USA); Centec Corp., Reston, VA (USA)). 1981. Contract AC06-76RL01830. 99p. NTIS, PC A05/MF A01. Order Number DE82018829.

The ten technologies chosen for case history development are: sonic sootblowing in boilers, boiler operation on oil-water emulsified fuel, energy efficient motors, computerized control of excess air for boilers, boiler control and load allocation, driving of waste-activated sludge by multiple effect evaporation, pre-drying of hog fuel, lime kiln computerization, heat wheel for process heat recovery, and organic Rankine bottoming cycle for thermomechanical pulping heat recovery. For each case study, there is given: the company name, employee contact, plant summary, a description of the energy consuming process and of the energy-saving action, an assessment of energy savings, and the decision process leading to the adoption of the measure. A data summary for discounted cash flow analysis is tabulated for each case. (LEW)

59693 **(PB—82-182874) Heat recovery from waste water by energy saving heat pump systems. Final report.** Flohrschutz, R.; Hau, E.; Wiedmann, U. (Commission of the European Communities, Luxembourg). [nd]. 287p. (EUR—7061-DE). NTIS PC E11/MF E11.

Waste heat from industrial cooling water and municipal waste water represents a major source to be utilized for large-scale heating systems in addition to the well-documented exploitation of environmental heat sources for heat recovery by heat pumps. An

added benefit to the community from the resulting heat impoverished waters would accrue from the reduction of heat pollution of receiving waters. Problems connected with the heat recovery from waste waters by heat pumps are discussed and solutions are suggested. They concern the removal of solids, the choice of a heat exchanger type with means for cleansing deposits, the design of a heat transport system and maintenance of the temperature level, the choice of prime movers and compressors, and the utilization of the recovered solids.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 59347, 59672, 59693

59694 **(AD-A—112365/2) Transient analysis of heat transmission systems.** Phetteplace, G.E. (Cold Regions Research and Engineering Lab., Hanover, NH (USA)). Dec 1981. 63p. (CRREL—81-24). NTIS, PC A04/MF A01.

This report develops a method of analysis for heat transmission systems operating under district heating load conditions. The method accounts for the effects of heat source and load characteristics. The use of thermal energy storage systems is outlined and advantages are given. The transmission model itself considers the following technical aspects: (1) frictional pressure losses in piping system, (2) pump characteristics, (3) pump driver characteristics, and (4) heat losses from the buried piping. The capital costs considered are the piping system and necessary pumps. Operation and maintenance costs include cost of heat loss and cost of pumping energy input. Allowances are also made for system maintenance and repair over the assumed lifetime.

59695 **(PB—82-180191) Electric utility forecasting of customer cogeneration and the influence of special rates. Final report.** Pickel, F.H. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Mar 1981. 17p. (MIT-EL—81-006). NTIS, PC A02/MF A01.

Cogeneration, or the simultaneous production of heat and electric or mechanical power, emerged as one of the main components of the energy conservation strategies in the past decade. Special tax treatment, exemptions from fuel use restrictions, and regulatory policy changes were crafted to encourage its more widespread adoption in anticipation of higher energy conversion efficiencies. The expansion of cogeneration still faces a broad spectrum of problems, current and future: environmental restrictions; capital constraints; fuel prices; utility rates and future utility economics; and the difficulties of management. The most debated issue has been the reform of rates between individual cogenerators and the local electric utility. Many of the major cogeneration studies in the late 1970's urged an analysis of the exact impact from current electric utility rates upon cogeneration project economics. The changes mandated by the Public Utilities Regulatory Policy Act of 1978 (PURPA) are now reaching the final implementation stage and the cogeneration projects of the mid 1970s are nearing completion. To better understand the relationship between utility rates, the economics of cogeneration, and its potential development, the New England Electric System and the Massachusetts Institute of Technology Energy Laboratory Utility Systems Group began a study to refine methods for forecasting cogeneration in a specific utility service area with special attention devoted to the utility rates.

3209 Education And Public Relations

59696 **(DOE/IR/11132—1) Conceptual framework for energy education, K-12.** (Enterprise for Education, Santa Monica, CA (USA)). May 1982. Contract AP01-80IR11132. 136p. NTIS, PC A07/MF A01. Order Number DE82020151.

After a brief statement of the goals of energy education, the concept of energy literacy is loosely defined and two ways are identified by which energy education can be introduced into school curricula. A number of related generalizations are identified that might form the basis for the development of energy curricula, followed in each case by a brief list of selected reference materials. These generalizations include lessons that may be taught on: conversion and measurement of energy, energy flow in the biosphere, human use of energy, energy history of the United States, energy from fossil fuels, nuclear reactions, and solar technologies, electricity as an energy carrier, economic and financial aspects of energy use, ethical issues in energy use, conservation of energy, shelter-related energy conservation, and transportation conservation. Some sample objectives are given that might be considered for use at various grade levels in a typical sequence, with widely used texts accompanying each example. 607 references. (LEW)

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 59702, 59704, 59706, 59707, 59943

59697 **(DOE/CS/50026—1) Alcohol/petroleum systems as fuels for diesel engines. Final report.** Johnson, R.T.; Friberg, S.E.; Stoffer, J.O. (Missouri Univ., Rolla (USA)). Jun 1982. Contract AC02-79CS50026. 244p. NTIS, PC A11/MF A01. Order Number DE82020752.

Alcohol/petroleum systems containing methanol, ethanol, water, and diesel fuels were formulated and evaluated. The purpose of the work was to develop and evaluate stabilized single phase fuel systems for diesel engines. These systems contained alcohol, contamination water, and a non-ionic chemical stabilizer in a base fuel. Preliminary formulation studies of some ionic stabilizer systems were also made. Fuel formulation work led to two fuel systems using hexanol as a stabilizer: one with azeotropic ethanol as the alcohol-water fuel portion and the second using methanol with 2% by weight water added as the alcohol-water component. Fuel property and engine tests show that the behavior of these systems is similar for three different base fuels of aromatic content from 20 to 40%. For commercial engines, the stabilized fuels demonstrated little change in energy efficiency or gaseous emissions over the base fuels. However, there were reductions in smoke and particulates, especially for the direct injection engine tested. The Soluble Organic Fraction of the particulates showed increases from a few percent to factors of three or more, accompanied by changes in character. Aldehyde emissions also demonstrated changes related to the alcohol used. Although some operational problems were encountered related to fuel vapor and dissolved fuel system deposits, the stabilized fuels generally behave as diesel fuel, reduced smoke and particulates, and could be handled as single phase fuels.

59698 **(PB—82-179417) EPA evaluation of the save-a-mile device under section 511 of the Motor Vehicle Information and Cost Savings Act. Technical report.** Shelton, J.C. (Environmental Protection Agency, Ann Arbor, MI (USA)). Oct 1981. 49p. (EPA-AA-TEB—511-82-2). NTIS, PC A03/MF A01.

This report announces the conclusions of the EPA evaluation of the 'Save-A-Mile' device under provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act. The 'Save-A-Mile' consists of a piece of copper cloth and a flat piece of insulating material which is placed between the carburetor and intake manifold of a gasoline engine. The stated purpose is to increase the efficiency of the engine and decrease the amount of pollutants generated. Although the limited amount of test data submitted by applicant did suggest some improvement over an unmodified induction system, the results were not obtained in accordance with EPA requirements and the data did not adequately quantify the amount of any improvement. In general, EPA has found that devices of this type are not effective in reducing emissions or improving fuel economy.

3303 Electric-powered Systems

59699 **(DOE/NASA/51044—27) Progress on advanced dc and ac induction drives for electric vehicles.** Schwartz, H.J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1982. Contract AI01-77CS51044. 15p. (NASA-TM—82895; CONF-821022—1). NTIS, PC A02/MF A01. Order Number DE82020308.

From AVERE drive electric conference; Amsterdam, Netherlands (25 Oct 1982).

Portions of document are illegible.

Progress in the development of complete electric vehicle propulsion systems is described, and the results of tests on the Road Load Simulator of two such system representative of advanced dc and ac drive technology are given. One is the system used in the DOE's ETV-1 integrated test vehicle which consists of a shunt-wound dc traction motor under microprocessor control using a transistorized controller. The motor drives the vehicle through a fixed ratio transmission. The second system, under development by the Eaton Corporation, uses an ac induction motor controlled by a transistorized pulse-width modulated inverter which drives through a two-speed automatically shifted transmission. The inverter and transmission both operate under the control of a microprocessor. The characteristics of these systems are also compared with the propulsion system technology available in vehicles being manufactured at the inception of the DOE program and with an advanced, highly integrated propulsion system upon which technology development was recently initiated.

59700 **(PB—82-198847) Development of a lead-acid battery with high energy and power density. Research report.** Baufeldt, K.E.; Borger, W.; Braeutigam, R.; Reinhard, A.O. (Varta Batterie A.G., Kelkheim (Germany, F.R.). Forschungs- und Entwicklungszentrum). Dec 1980. Translation of German monograph. 169p. NTIS, PC A08/MF A01.

The energy density of lead-acid cells has been increased to more than 50 Wh5/kg by two different ways: firstly, by means of forced electrolyte flow through the active materials, secondly, by means of a new construction method with a chequered electrode arrangement based on minimized electrolytic and electronic conduction paths, and on optimized volume/surface area proportion. This cell shows particularly at higher loads an outstanding capacity behavior; at the one-hour discharge the energy density is twice of that of the MAN-bus cell. From our present experience we conclude that the energy density of the lead-acid system can be increased up to 60 Wh5/kg. As to the cycle life of the positive electrode, the 'antimony-free effect' causing the premature failure of cells in cycle tests, can now be explained on the basis of a model. As a consequence it will be possible to apply corrosion resistant grid materials without antimony also for cells specifically designed for repeated deep discharges. Due to our improved understanding of the expander mechanism we developed the expander depot and a method of rejuvenating negative plates, which failed because of sintering, using special expander materials. This procedure has been applied successfully to a MAN-bus battery. With reference to the battery periphery our experiences on a H_2/O_2 gas recombination device have resulted in a hermetically sealed lead-acid cell for electric vehicles. For the remote control of the state of charge an indicator with automatic temperature compensation has been developed.

3304 Hybrid Systems

REFER ALSO TO CITATION(S) 59617

59701 **(CONF-820827—15) Electric-hybrid-vehicle simulation.** Pasma, D.C. (Oak Ridge National Lab., TN (USA); Eaton Corp., Southfield, MI (USA). Engineering and Research Center). 1982. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020838.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The simulation of electric hybrid vehicles is to be performed using experimental data to model propulsion system components. The performance of an existing ac propulsion system will be used as the baseline for comparative purposes. Hybrid components to be evaluated include electrically and mechanically driven flywheels, and an elastomeric regenerative braking system.

3307 Emission Control

REFER ALSO TO CITATION(S) 59698

59702 **(AD-A—112170/6) Automotive cold-start carbon monoxide emissions and preheater evaluation. Special report.** Coutts, H.J. (Cold Regions Research and Engineering Lab., Hanover, NH (USA)). Dec 1981. 37p. (CRREL-SR—81-32). NTIS, PC A03/MF A01.

Fairbanks and Anchorage, Alaska, experience high wintertime ambient levels of carbon monoxide (CO). Emissions from starting automobile engines in cold weather are thought to be a major source of CO. A quantitative procedure for determining startup CO emissions was developed. The startup emissions were measured as a function of soak time at several low ambient temperatures. The performance of engine preheaters in reducing the startup CO at the various soak times and temperatures was estimated. The data scatter was too great to draw any firm conclusions; however, the length of cold-soak time appeared to have a stronger effect on cold-start CO emissions than did soak temperatures (0 to -30 C). Compared to no preheat, continuous preheat during an overnight cold soak can reduce the cold-start CO emissions by 20 to 90%.

59703 **(PB—82-183567) Evaluation of the Paser Magnum/Paser 500/Paser 500 HEI under section 511 of the Motor Vehicle Information and Cost Savings Act. Technical report.** Barth, E.A. (Environmental Protection Agency, Ann Arbor, MI (USA)). May 1981. 183p. (EPA-AA-TEB—511-81-5B). NTIS, PC A09/MF A01.

This document contains the attachments of the EPA evaluation of the 'Paser Magnum, Paser 500, and Paser 500 HEI' devices under provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act. These attachments include patent information, correspondence between the Applicant and EPA and all documents submitted in support of the application. The entire report is contained in two volumes. The discussions, conclusions and list of all attachments are included in EPA-AA-TEB-511-81-5A, which consists of 22 pages. The attachments are contained in EPA-AA-TEB-511-81-5B, which consists of 181 pages.

59704 **(PB—82-188699) Sulfate and particulate emissions from in-use catalyst vehicles: regulated/unregulated emissions and fuel economy. Final report.** Gibbs, R.E.; Wotzak, G.P.; Byer, S.M.; Kolak, N.P. (New York State Dept. of Environmental Conservation, Albany (USA)). Dec 1979. 123p. NTIS, PC A06/MF A01.

An emissions and fuel economy study of 56 catalyst cars in consumer use and maintenance has been performed by repeated testing of the cars over a two and one-half year period. This report summarizes analyses of the data base, and includes results on idle CO levels, mass emissions of HC, CO, NOx, sulfate, SO_2 and total particulate; total particulate elemental analyses, catalyst activity, and fuel economy. Test cycles used were the 1975 FTP, one-hour 50 mph cruise, Congested Freeway Driving Schedule, Highway Fuel Economy Test, and idle, 30 and 50 mph cruise for catalyst activity tests. Fuel economy data for over-the-road driving are also presented from on-board totalizing fuel and engine hour meters on each car. Idle CO indicative of maladjusted carburetors (greater than 1%) was found to correlate with FTP CO emissions, purge of stored sulfur in the form of SO_2 from catalysts, and decreases in catalyst activity at idle in comparison to 30(2) and 50 mph activity results. Particulate sulfur emissions accounted for only 3.7% of fuel sulfur for the 256 CFDS tests in the data base. Over-the-road fuel economy was most closely represented by the FTP (city) value.

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 59697

59705 **(AD-A—112609/3) Suitability of shale fuels for army generator sets. Interim report May 80-Sep 81.** Monte-Mayor, A.F. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). Dec 1981. 69p. (AFLRL—142). NTIS, PC A04/MF A01.

Gasoline, diesel, and gas turbine generator sets were examined to determine which shale fuel properties might adversely affect their performance, Information from engine manufacturers, fuel system manufacturers, U.S. Army Troop Support and Aviation Readiness Command (USATSARCOM) personnel and existing literature was consulted to identify existing/potential problems. Known shale fuel properties were presented and compared to military specifications. Generator sets were separated into major grouping by the fuel systems they employ. A listing of generator sets was included in order to facilitate generator set selection for testing. In general, the performance of shale fuels seemed to be comparable to that of petroleum fuels. Long-term problems such as elastomer degradation, poor life, and difficult cold weather starting may manifest themselves if refiners are unable to meet military specifications. Based on the fuels produced to date, refiners should be able to meet specifications and provide shale fuels suitable for generator set operation. Several fuel properties not covered in military specifications (such as lubricity and hydrocarbon composition) were seen as potential problem areas. A recommended test procedure has been provided to test the areas of concern presented in this report.

59706 **(DOE/CS/51212—T1) Hydrogen-engine performance-analysis project. Third quarterly report, second year of program, September 1978.** Adt, R.R. Jr.; Swain, M.R.; Pappas, J.M. (Miami Univ., Coral Gables, FL (USA). Dept. of Mechanical Engineering; Hawthorne Research and Testing, Inc., Coral Gables, FL (USA)). 1978. Contract AC03-77CS51212. 26p. NTIS, PC A03/MF A01. Order Number DE82021980.

Portions of document are illegible.

The objective of this 3-year research effort is to obtain the design data-base covering performance, operational and emissions characteristics essential for making a rational decision regarding the selection and design of prototype hydrogen-fueled, air-breathing engines capable of being manufactured for general automotive use. Work accomplished during the third quarter of the second year is reported. Information is included on the construction and installation of the timed-induction cylinder head, performance of experiments with 4 of 10 engines, reduction of experimental data, generation of a computer program to calculate fuel consumption and NO/sub x/ emissions from a hydrogen-fueled vehicle over a driving cycle, and performance of experiments to further study flashback characteristics employing air injection into the intake manifold. The results show that: hydrogen-fueled automobiles should have NO/sub x/ emissions below currently legislated levels; controlling NO/sub x/ emissions by using the discontinuity mode of operation causes a loss in BTE and a better option is to use larger engine displacement; and flashback with the gas-mixer carburetor was very severe and must be improved. (LCL)

59707 **(DOE/CS/56051—7) Status of alcohol-fuels-utilization technology for highway transportation: a 1981 perspective. Volume I. Spark-ignition engines.** (Mueller Associates, Inc., Baltimore, MD (USA)). May 1982. Contract AC05-79CS56051. 99p. NTIS, PC A05/MF A01. Order Number DE82020493.

The current status of the technology(ies) of alcohol utilization in highway transportation is reviewed. The use of methanol, ethanol, and certain of their derivatives in vehicles powered by spark-ignition engines is treated in this volume. Alcohol utilization in diesel-powered vehicles is covered in Volume II. The results of engine, vehicle, and fuels testing are summarized. The topics of exhaust emissions, performance and fuel economy, vehicle driveability, fuel systems materials compatibility, engine and vehicle design, fuels characterization, and environmental considerations are discussed, based upon the most recent data available at this time. The status of the technology at the time of the last comprehensive survey (1978) is summarized and discussed. Significant advances made since that time are delineated, as are remaining information gaps and areas in which more extensive investigation is still needed. An appendix to this Volume (I) describes important properties of selected alcohols and alcohol-derived fuels.

36 MATERIALS

REFER ALSO TO CITATION(S) 59118

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 59213, 59303, 59342, 59410, 59463, 59485, 59486, 59496, 59510, 59519, 59528, 59529, 59553, 59554, 59555, 59576, 59579, 59579, 59624, 59765, 59771, 59844, 59908, 59926, 60141, 60589, 60592, 60652, 60668, 60673, 60674

59708 **(BNL—31648) Electrochemical aspects of stress-corrosion cracking of sensitized stainless steels.** Newman, R.C.; Sieradzki, K.; Isaacs, H.S. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 29p. NTIS, PC A03/MF A01. Order Number DE82020003.

Portions of document are illegible.

The intergranular stress-corrosion cracking (SCC) of sensitized Type 304 stainless steel has been studied using sodium thiosulphate solutions at room temperature. Electrochemical aspects of the cracking have been examined using a potentiostatic scratching electrode technique applied to simulated grain boundary alloys. These results are compared with the current transients observed after intergranular fracture of embrittled specimens under the electrolyte. Dissolution kinetics within actual propagating cracks have been examined using load modulation. Rapid intergranular failure in a thiosulphate solution can be induced by successive load pulses of extremely short duration. Difficulties in accounting for the SCC velocities by an electrochemical mechanism are discussed.

59709 **(BNL—31649) Detection of defects and metallurgical variations in metal surfaces.** Isaacs, H.S. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 13p. (CONF-820205—5). NTIS, PC A02/MF A01. Order Number DE82020372.

From 111. AIME annual meeting; Dallas, TX, USA (1 Feb 1982).

A highly sensitive non-destructive method employing a scanning technique is described for sensing variations in metal surfaces in aqueous environments, using ac impedance. The probe consisted of a dual compartment with two orifices passing through its base and housing a pseudo-reference electrode and an electrode for current injection. Measurements have shown that the technique can detect differences due to metallurgical variations in welds and its heat affected zones and the presence of cracks in pre-cracked specimens. Details of the methodology and principles are given.

59710 **(CEA-CONF—5908) Fatigue and creep-fatigue in sodium of 316 L stainless-steel.** Ardellier, A. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Dept. des Reacteurs a Neutrons Rapides). Mar 1981. 9p. (CONF-810369—4). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702974.

From International seminar on physical chemistry of liquid metals; Karlsruhe, F.R. Germany (24 Mar 1981).

The present paper describes test-facility developed to perform low-cycle fatigue and creep-fatigue interaction in sodium on stainless steel - 316 L . Fatigue life in sodium and in air are compared. A beneficial effect in sodium is noted.

59711 **(DOE/ER—0143) Materials Sciences programs. Fiscal year 1982.** (USDOE Office of Energy Research, Washington, DC. Materials Sciences Div.). Sep 1982. 197p. NTIS, PC A09/MF A01. Order Number DE82021748.

The purpose of this report is to provide a convenient compilation and index of the DOE Materials Sciences Division programs. This compilation is intended for use by administrators, managers, and scientists to help coordinate research and as an aid in selecting

new programs. The report is divided into five sections. Section A contains all laboratory projects, Section B has all contract research projects, Section C has information on DOE collaborative research centers, Section D shows distribution of funding, and Section E has various indices.

59712 **(DOE/ER/01198—1378) Science of materials. Progress report, January 1, 1981-December 31, 1981.** (Illinois Univ., Urbana (USA). Materials Research Lab.). 1981. Contract AC02-76ER01198. 278p. NTIS, PC A13/MF A01. Order Number DE82021606.

Portions of document are illegible.

The research program is designed to provide information concerning basic properties of materials that are important for the development of energy systems. The emphasis is on the synthesis and characterization of new materials with novel properties for future applications. The research program includes studies of the microchemistry and microstructure; the deformation, corrosion and fracture of metals, ceramics and alloy materials are of particular concern, as is the hydrogen embrittlement of metals; also under investigation are the mechanism of heat transfer across interfaces, catalytic properties of surfaces, and erosion of surfaces by fluid suspended particles. The new materials and materials configurations now being fabricated for research on energy applications include a variety of metastable ceramic, metallic, semi-conducting and molecular assemblies.

59713 **(DOE/ER/04385—6) Pore shrinkage and Ostwald ripening in metallic systems. Final report.** Kuczynski, G.C.; Allen, C.W. (Notre Dame Univ., IN (USA)). Jun 1982. Contract AC02-77ER04385. 8p. (COO—4385-6). NTIS, PC A02/MF A01. Order Number DE82021916.

Ostwald ripening is the phenomenon of coarsening with time of a phase dispersed on a substrate or within a crystalline or glassy matrix. The established theory of this phenomenon is due to Lifshitz and Slyozov and to Wagner, with a number of extensions. Prompted by the fact that a number of experimental details consistently disagree with specific predictions of this theory (LSW theory), Kuczynski began in the mid 1970's to examine other possible theoretical approaches to this particle coarsening problem. Thus, this project set out to derive the size distribution function of particles on a wholly different basis from that of LSW theory. In addition, it undertook to develop statistically very reliable experimental distributions against which the theories could be gauged. The basis for this new theoretical derivation (K-theory) is the principle of irreversible thermodynamics due to Prigogine, that a system in steady state exhibits a minimum rate of entropy production.

59714 **(DOE/ER/05002—28) Structure of large-angle grain boundaries in metals and ceramic oxides.** Balluffi, R.W.; Bristowe, P.D.; Brokman, A. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Materials Science and Engineering). Aug 1982. Contract AC02-78ER05002. 45p. NTIS, PC A03/MF A01. Order Number DE82022006.

Recent progress in the understanding of grain boundary structure in metals and ceramic oxides is critically reviewed with emphasis on both experimental and theoretical work. The review essentially updates an earlier review presented at the 1979 Fall Meeting: i.e., R.W. Balluffi, P.D. Bristowe and C.P. Sun, J. Amer. Ceram. Soc. 64, 25 (1981).

59715 **(FEI—1235) Long-term rupture strength and creep in the 0Kh16N15M3B steel under constant and varying conditions.** Pykhtin, V.M.; Zvereva, L.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1981. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702643.

Young-term rupture strength and creep in plate and thin-walled tubular specimens of the 0Kh16N15M3B steel at 600, 650 and 700 deg C under constant stress and under stresses varying according to a two-step regime are presented. The equations are obtained for experimental stress and temperature dependences of time to fracture and steady creep rate. It is shown that damage accumulation in plate specimens proceeds non-linearly.

59716 **(FEI—1240) Iron diffusion in iron-chromium-molybdenum-silicon system alloys in alpha field.** Gladyshev, A.M.; Pavlinov, L.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702644.

The method of experiment planning was applied to investigate the combined effect of chromium, molybdenum and silicon on iron diffusion in iron-15-20% chromium, 2% molybdenum, 2% silicon alloys in an alpha-phase field. Diffusion coefficients for iron were determined using an analytical version of the method of integral residue and Fe^{59} radioactive isotope in the temperature range of 850 to 1200 deg C. Iron diffusion coefficient for all alloys considered is found to be higher and activation energy to be lower than for self-diffusion in pure α-iron. Silicon alloying is noted to increase significantly a diffusional mobility level.

59717 **(HEDL-SA—2683) Analytical electron microscopy of neutron-irradiated reactor alloys.** Thomas, L.E. (Hanford Engineering Development Lab., Richland, WA (USA)). 26 Mar 1982. Contract AC06-76FF02170. 5p. (CONF-820806—2). NTIS, PC A02/MF A01. Order Number DE82020504.

From 40. Electron Microscopy Society of America annual meeting; Washington, DC, USA (9 Aug 1982).

Exposure to the high neutron fluxes and temperatures from 400 to 650°C in the core region of a fast breeder reactor profoundly alters the microstructure and properties of structural steels and superalloys. The development of irradiation-induced voids, dislocations and precipitates, as well as segregation of alloying elements on a microscopic scale has been related to macroscopic swelling, creep, hardening and embrittlement which occur during prolonged exposures in reactor. Microanalytical studies using TEM/STEM methods, primarily energy dispersive x-ray (EDX) microanalysis, have greatly aided understanding of alloy behavior under irradiation. The main uses of analytical electron microscopy in studying irradiated alloys have been the identification of irradiation-induced precipitates and determination of the changes in local composition due to irradiation-induced solute segregation.

59718 **(HEDL-TME—81-37) Transmutation of alloys in MFE facilities as calculated by REAC (a computer code system for activation and transmutation).** Mann, F.M. (Hanford Engineering Development Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76FF02170. 76p. NTIS, PC A05/MF A01. Order Number DE82020505.

A computer code system for fast calculation of activation and transmutation has been developed. The system consists of a driver code, cross-section libraries, flux libraries, a material library, and a decay library. The code is used to predict transmutations in a Ti-modified 316 stainless steel, a commercial ferritic alloy (HT9), and a V-15%Cr-5%Ti alloy in various magnetic fusion energy (MFE) test facilities and conceptual reactors.

59719 (INIS-mf—7059(v.2), pp vp) **Irradiation effects on Mo-Si and Pd-Si amorphous alloys by means of positron annihilation.** Itoh, F.; Fukunaga, T.; Suzuki, K. (Tohoku Univ., Sendai (Japan). Research Inst. for Iron, Steel and Other Metals); Hasegawa, M. (Tohoku Univ., Ibaraki (Japan). Research Inst. for Iron, Steel and Other Metals). 1981. Dep. NTIS (US Sales Only).

From International conference on amorphuos systems investigated by nuclear methods; Balatonfuered, Hungary (31 Aug 1981).

Fast neutron irradiation effects on Mo-Si amorphous alloy and Pd-Si glassy alloy were studied by means of positron annihilation and X-ray diffraction measurements. Changes of positron annihilation characteristics in these amorphous alloys due to the neutron irradiation are discussed in correlation with structural changes of the atomic arrangement and it is concluded that positrons are trapped in open spaces inherent to the amorphous structure in the alloys. (author).

59720 (INIS-mf—7059(Vol.1), pp vp) **Hyperfine fields in metallic glasses.** Panissod, P.; Durand, J. (Strasbourg-1 Univ., 67 (France)); Budnick, J.I. (Connecticut Univ., Storrs (USA). Dept. of Physics). 1981. Dep. NTIS (US Sales Only).

From International conference on amorphuos systems investigated by nuclear methods; Balatonfuered, Hungary (31 Aug 1981).

59721 (INIS-mf—7068) **Preparation of Nb-Si phases by cathode sputtering, in particular the superconducting phase of epitactically grown A15-Nb_3Si.** Siefken, U. (Muenchen Univ. (Germany, F.R.). Fakultaet Chemie und Pharmazie). 27 Nov 1979. 193p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82780662.

Thesis.

The search for new superconducting materials with high transition temperatures is concentrated on alloys with a cubic A15 structure (Cr_3Si structure). In this paper we present the preparation of metastable A15-Nb_3Si which is expected to have a very high transition temperature Tsub(c). The properties of the A15 structure which are relevant for superconductivity are described, in particular the orthogonal chains as the most important structural characteristic, metastability, and the relation between lattice defects and transition temperature. For target compositions of 75% Nb / 25% Si and 80% Nb / 20% Si A15-Nb_3Si transition temperatures of Tsub(c) = 5.3 K and Tsub(c) = 7.5 K have been measured respectively, with lattice constants asub(o) = 5.19 A and asub(o) = 5.18 A.

59722 (INIS-SU—86, pp 169) **Synthesis and x-ray phase analysis of intermetallic compounds of americium and curium with platinum group metals.** Radchenko, V.M.; Ryabinin, M.A.; Shimbarev, E.V.; Sudakov, L.V.; Kapshukov, I.I.; Vasil'ev, V.Ya. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59723 (INIS-SU—86, pp 63) **Preparation of metals with high ratios of electric resistances.** Kopetskij, Ch.V.; Nikolaev, R.K.; Golov, E.F.; Kusaev, Yu.I.; Lichkova, N.V.; Matveev, V.N.; Nikiforova, T.V.; Plyushcheva, S.V.; Smirnov, V.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59724 (INIS-SU—86, pp 50) **Homogeneity region of cadmium telluride.** Ivanov, Yu.M.; Lejbov, V.A.; Vanyukov, A.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59725 (INIS-SU—86, pp 62) **Properties of high-pure metals.** Kopetskij, Ch.V.; Mezhov-Deglin, L.P.; Matveev, V.N.; Petrashov, V.T.; Shvindlerman, L.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59726 (INIS-SU—99, pp 147) **Study of kinetics of processes of high refining of liquid refractory metals in vacuum.** Elyutin, A.V.; Voronenko, L.I.; Timofeev, E.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59727 (INIS-SU—99, pp 127-129) **Study of chemical interaction in multicomponent systems.** Belov, A.F.; Viskov, A.S.; Godovikov, S.K.; Gubskaya, G.F.; Terent'eva, V.S.; Ufimtseva, E.V.; Frolov, Yu.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59728 (INIS-SU—99, pp 113-114) **Application of thermodynamic calculation methods of phase diagrams for solution of alloys chemistry practical problems.** Mogutnov, B.M.; Shaposhnikov, N.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59729 (INIS-SU—99, pp 108-109) **Method of crystalline quasi-particles and thermodynamics of reduction processes.** Dobrovinskij, R.Yu.; Mesnyankina, S.L.; Ishchenko, F.A.; Men, A.N.; Chufarov, G.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59730 (INIS-SU—99, pp 107-106) **Regularities of changes of phase diagrams of metal-carbon systems at high pressures depending on metal atomic number.** Kamenetskaya, D.S.; Chagar, T.P.; Shterenberg, L.E. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59731 (INIS-SU—99, pp 101-102) **Effect of the second component on thermodynamic properties of binary iron liquid alloys.** Batalin, G.I.; Sudavtsova, V.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59732 (INIS-SU—99, pp 125-127) **Factors, affecting interstitial solid solution stability in molybdenum and chromium alloys.** Ageev, N.V.; Kantor, M.M.; Model, M.S.; Konstantinov, S.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59733 (INIS-SU—99, pp 136-137) **Crystallochemistry of interstitial phases formed plane defects in molybdenum alloy and in chromium.** Novikov, I.I.; Sofronova, R.M.; Chervinskij, V.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59734 (INIS-SU—99, pp 141-142) **Effect of electronic structure on the formation of metastable phases in zirconium-niobium-tin-iron system.** Alekseenko, G.K.; Korotkova, N.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59735 (INIS-SU—99, pp 155) **Prediction methods of structural stability of complex alloys on the nickel-chromium base.** Rtishchev, V.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59736 (INIS-SU—99, pp 156-158) **Role of chemistry in formation of amorphous metallic alloys during quenching from liquid state.** Skakov, Yu.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59737 (INIS-SU—99, pp 100-101) **Compacting of metallic powder bodies.** Ermanok, M.Z. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59738 **(INP—1066/PL) Proceedings of 17. winter school on hyperfine interactions.** Kulessa, R.; Krolas, K. (eds.). (Institute of Nuclear Physics, Krakow (Poland)). 1979. 365p. (CONF-790282—). NTIS (US Sales Only), PC A16/MF A01. Order Number DE82780636.

From 17. winter school on hyperfine interactions; Bielsko-Baila, Poland (19 Feb 1979).

Abstracts of individual items from the proceedings were prepared separately for the data base. (GHT)

59739 (KFTI—80-44, pp 66-71) **High-temperature deformation of nickel irradiated with high energetic electrons.** Ozhigov, L.S.; Parkhomenko, A.A.; Klyukovich, V.A.; Rybal'chenko, N.D.; Kuz'michev, M.A.; Brus, A.S. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

In Radiation damage physics and radiation technology.

High-temperature radiative embrittlement (HTRE) of nickel irradiated by high-energy electrons and, in particular, the relationship of HTRE with the processes occurring at the boundaries of grains of the irradiated material deformed at high temperatures have been the subject of investigation. Proceeding from an analysis of tension curves and metallographic studies, it has been shown that in the HTRE temperature range the irradiation results in a decrease in strength of grain boundaries. Alongside with strengthening the grain body with helium bubbles, this leads to violation of the strength balance of the grain body-grain boundary system. As a result, at the early stages of deformation (in helium-containing materials only) there appears a grain-boundary slip and the strain hardening coefficient of the material decreases. A relationship between the HTRE value and strain hardening coefficient variation has been established for nickel in a wide range of fluences ($2x10^{18}$-$1.1x10^{21}$ electron/cm^2).

59740 (KFTI—80-44, pp 82-86) **Kinetics helium evolution from steel OKh16N15M3B irradiated with helium ions.** Karasev, V.S.; Kovyrshin, V.G.; Vorontsova, G.A.; Sav'yan, P.K. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij); Neklyudov, I.M.; Pivovar, L.I.; Rybalko, V.F.; Tolstolutskaya, G.D. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

In Radiation damage physics and radiation technology.

Investigated is gas evolution from the samples of stainless 0Kh16N15M3B steel irradiated by helium ions with an energy of 800 keV up to the doses $5x10^{16}$ - $1.2x10^{18}$ cm^{-2} at 50 deg C. Gas evolution and change of the surface structure has occurred on heating the samples with constant pared with analogous processes rate from 50 to 1300 deg C. Some stages have been observed on gas evolution curves. The results obtained show that the character of helium thermodesorption depends on the implantation dose. If at doses of < or approximately $5x10^{16}$ cm^{-2} the helium evolution proceeds along one channel only, then the number of thermodesorption channels increases up to five with increasing the dose. The measured values of activation energy and the data on a change in the sample surface structure make it possible to judge on the mechanisms of gas evolution along each of channels.

59741 (KFTI—80-48, pp 72-80) **Erosion and mass transfer of Mo, W and Nb under neutron irradiation of high temperature materials.** Berzhatyi, V.I.; Luk'yanov, A.N.; Zavalishin, A.A.; Tkach, V.N.; Fedorenko, A.I. 1980. (In Russian). Dep. NTIS (US Sales Only).

In Physics of radiation damage and radiation material science.

Studies have been made of the medium composition in thermionic fuel elements of two types during reactor tests; erosion and mass transfer of electrode materials have been investigated in the after-reactor analysis of the tested fuel elements. The studies of electrode material evaporation at the conditions approaching (in environment temperature and composition) those of reactor tests of thermionic fuel elements have shown that the process proceeds in the form of metal oxides. Evaporation rates are determined, the mechanism of evaporation is discussed, and the analytical dependences are obtained for calculating the evaporation rates of Mo and W at certain temperature and gaseous medium composition. It is found that the main contribution to the material transfer off the Mo and Nb surfaces under a high-temperature reactor irradiation comes through the thermal evaporation; in the case of tungsten at the same experimental conditions the rates of mass transfer due to thermal evaporation and neutron sputtering are nearly the same.

59742 (OEFZS—4086, pp P1-P19) **Crack initiation and growth in Inconel 625 as received and after ageing at high temperature in HHT helium.** Ullrich, G. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)); Panic, B.; Stumpp, W. (Sulzer Bros. Ltd., Winterthur (Switzerland)). May 1981. Dep. NTIS (US Sales Only).

From IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors; Vienna, Austria (4 May 1981).

In the framework of HHT material technology, the decontamination (for servicing purposes) of components is an area which must be considered. The effects of chemical decontaminants may influence the mechanical properties of the materials. Besides creep and high and low cycle fatigue on cylindrical specimens a fracture mechanics program using compact tension specimens with notch radius r = 0.1 mm and a/w approximately 0.35 (ASTM standard), but without pre-fatigue cracks is being carried out. In this work, results from crack initiation and growth in parent and 112 electrode weld metal in both the as-received and heat treated (800°C in HHT helium) conditions are presented. The crack initiation was determined with a potential method and the crack growth was followed using foil gauges using also a potential method. The data of the crack growth/load cycle number (da/dN) and the stress intensity factors ΔK, were determined at a constant stress ratio R. Of particular interest is the threshold value ΔK_0.

59743 (OEFZS—4086, pp R1-R12) **Weldability evaluations and weldment properties of Hastelloy X.** King, J.F.; McCoy, H.E.; Rittenhouse, P.L. (Oak Ridge National Lab., TN (USA)). May 1981. Dep. NTIS (US Sales Only).

From IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors; Vienna, Austria (4 May 1981).

Studies of weldability and weldment properties were conducted on commerical heats of Hastelloy X. Weldment preparation was done using several combinations of welding techniques and filler metals. Evaluation methods employed included hot cracking susceptibility and tensile and creep properties measured both before and after aging at 593 to 871°C for up to 10,000 h.

59744 (OEFZS—4086, pp T1-T15) **High temperature low-cycle fatigue and tensile properties of Hastelloy X and alloy 617 in air and HTGR-helium.** Strizak, J.P.; Brinkman, C.R.; Rittenhouse, P.L. (Oak Ridge National Lab., TN (USA)). May 1981. Dep. NTIS (US Sales Only).

From IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors; Vienna, Austria (4 May 1981).

Results of strain controlled fatigue and tensile tests are presented for two nickel base solution hardened alloys which are reference structural alloys for use in several high temperature gas cooled reactor concepts. These alloys, Hastelloy X and Inconel 617, were tested at temperatures ranging from room temperature to 817°C in air and impure helium. Materials were tested in the solution annealed as well as in the pre-aged condition where aging consisted of isothermal exposure at one of several temperatures for periods of up to 20,000 h. Comparisons are also given between the strain controlled fatigue lives of these alloys and several other commonly used alloys all tested at 538°C.

59745 **(SAND—82-1789C) Case history of tantalum-weld cracking.** Knorovsky, G.A. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 12p. (CONF-820476—1). NTIS, PC A02/MF A01. Order Number DE82020358.

From 25. meeting of the IMOG subgroup on joining; Kansas City, MO, USA (26 Apr 1982).

Tantalum welding is normally a routine operation. Of course, the routine involves careful cleaning beforehand, and welding in an atmosphere which excludes reactive gases (O_2, N_2, H_2). Recently a weld cracking problem was encountered at SNLA de-

spite the fact that normal precautions had been taken. This account reviews what happened, the analytical procedures followed to determine the unusual source of the problem, and the remedy which solved the problem.

59746 **(SAND—82-8224) Centerline cracking in electron-beam cap-to-header welds in Type 304L stainless steel.** Lippold, J.C. (Sandia National Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 35p. NTIS, PC A03/MF A01. Order Number DE82020858.

Portions of document are illegible.

Two sets of cap-to-header EB welds in Type 304L exhibited a significant difference in hot cracking susceptibility which could be associated with the heat-to-heat variations in chemical composition and the resultant change in solidification behavior of the fusion zone. In one case, solidification of the entire fusion zone occurred with delta ferrite as the primary phase of solidification and resulted in crack-free weldments. In the other case, a localized shift from solidification as delta ferrite to solidification as austenite along the weld centerline was accompanied by hot cracking in the austenitic region. Segregation of nitrogen, a powerful austenite former, to the weld centerline promoted the transition to solidification as austenite. Microprobe and Auger surface analyses of the crack-susceptible microstructures revealed that enhanced sulfur segregation accompanied the shift in solidification behavior and was integral in the mechanism of crack formation.

59747 **(UCRL—87392) Mechanical properties evaluation of some commercial beryllium materials.** Goldberg, A.; Hanafee, J.E.; Scott, R.G. (Lawrence Livermore National Lab., CA (USA)). 30 Jun 1982. Contract W-7405-ENG-48. 59p. (CONF-820459—3). NTIS, PC A04/MF A01. Order Number DE82020851.

From Beryllium subwog meeting; Denver, CO, USA (19 Apr 1982).

The integrity of a beryllium component that had developed questionable etching patterns on chemical milling is evaluated. The tensile properties of the beryllium material, which was vacuum hot-pressed (VHP), and the same material after an additional hot isostatic pressing (VHP/HIP) were compared to the properties obtained on two acceptable beryllium materials. Tensile testing was performed under strain-rate control conditions at $\sim 1 \times 10^{-4}$ and 2×10^{-3}/s at -22°, 22°, and 55°C. The tensile properties of the four materials fell within specifications and no obvious differences in their ductilities were observed. However, differences in strength values were obtained. In addition, yield drops were observed for the reference materials, while the VHP and VHP/HIP materials showed only a small inflection in strain-hardening following initial yielding. Both the yield drop and inflection in strain-hardening became more pronounced with an increase in temperature.

59748 **(WAPD-TM—1431) Metallographic standards for estimating hydrogen content of Zircaloy-4 tubing (LWBR development program).** Hyatt, B.Z. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Feb 1982. Contract AC11-76PN00014. 52p. NTIS, PC A04/MF A01. Order Number DE82022074.

Metallographic standards (with 10 to 11,600 ppM H_2) for estimating hydrogen content of LWBR Zircaloy-4 tubing were prepared by corrosion of Zircaloy-4 tubing specimens in LiOH solutions at 600°F and 680°F. Microstructures and measured hydrogen contents of several standards agreed well with microstructures and measured hydrogen of an irradiated corroded Zircaloy-4 tubing specimen and an unirradiated hydrided Zircaloy-4 sheet specimen. Vickers hardness data and corrosion weight gain data also are presented. 34 figures, 5 tables.

59749 **(Y/DW—341) X-ray-diffraction study of shape memory in uranium-niobium alloys.** Carpenter, D.A.; Vandermeer, R.A. (Oak Ridge Y-12 Plant, TN (USA)). 3 Aug 1982. Contract W-7405-ENG-26. 6p. (CONF-820861—1). NTIS, PC A02/MF A01. Order Number DE82020620.

From 31. annual Denver X-ray conference; Denver, CO, USA (3 Aug 1982).

An x-ray diffraction study of the reversible deformation modes associated with the shape memory effect has been carried out on a series of uranium-niobium alloys near the monotectoid composition (6.2 wt % Nb). Diffraction patterns were measured as a function of strain, in situ, while the specimens were under stress as part of an attempt to explain the easy-flow, low-strain plateau in the stress-strain curve. The alloys, consisting of highly twinned, metastable α'' (monoclinic) and γ^0 (tetragonal) phases derived from the high-temperature BCC γ phase, produced broad, overlapping diffraction lines difficult to analyze by conventional techniques. One solution to this problem was to use a segmented step-scan technique so as to apportion the scan time to concentrate on the most difficult regions. This paper discusses data obtained from an α'' alloy and a dual-phase $\alpha'' + \gamma^0$ alloy.

59750 **Advances in fracture research (Fracture 81). Vol. 1.** Francois, D. (ed.). Oxford, England; Pergamon Press (1982). vp. (CONF-810373—(Vol.1)).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

A separate abstract was prepared for each item in scope for the Energy Data Base. (HDR)

59751 **Advances in fracture research (Fracture 81).** Francois, D. (ed.). Oxford, England; Pergamon Press (1982). vp. (CONF-810373—(Vol.3)).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

A separate abstract was prepared for each item in scope for the Energy Data Base. (HDR)

59752 **Advances in fracture research (Fracture 81). Volume 6.** Francois, D. (ed.). Oxford, England; Pergamon Press (1982). vp. (CONF-810373—(Vol.6)).

From 5. international conference on fracture; Cannes, France (29 Mar 1981).

A separate abstract was prepared for each item in scope for the Energy Data Base. (HDR)

59753 **Effect of various anodic coatings on the creep behavior of a strong aluminum alloy.** Arbel, A. (Brookhaven National Lab., Upton, NY); Natan, M. *Materials Science and Engineering;* **43**: 235-240(1980).

Comparative creep tests were conducted on a strong creep-resistant aluminum alloy, uncoated and coated with thin, medium and thick anodic layers. None of the various anodic coatings exhibited any strengthening effect similar to that which strong adherent coatings or inherent surface layers have been observed to have on room or elevated temperature plastic deformation of annealed monocrystalline or polycrystalline metals and alloys. This lack of strengthening effect can be explained by the fact that coherent precipitates effectively impeded the motion of dislocations throughout the bulk of the creep-resistant alloy; thus the anodic coatings did not have the impact which strong surface layers and coatings have on annealed materials where these layers or coatings are the main direct or indirect obstacle to the motion of dislocations and their egress to the surface. Cracks in the medium and heavy coatings served as surface stress raisers, thus resulting in faster secondary creep rates compared with those of the uncoated and thinly coated specimens. 17 references, 3 figures, 1 table.

59754 **(UCRL-Trans—11784) Fracture toughness of cast iron (mainly about nodular cast iron).** Kobayashi, T. Translated from *Nippon Kinzoku Gakkai Kaiho ;* **18**: No. 7, vp(1979). Contract W-7405-ENG-48. 21p. NTIS (US Sales Only). Order Number DE82019098.

Portions of document are illegible.

Cast iron is an Fe-C-Si series multi-component alloy containing more than 2% of C, which is more likely in the form of graphite than quasi-stable Fe_3C. As the strength of graphite is around several tens of MPa, its presence in the cast iron is equivalent to the distribution of many defects throughout the material. From the material strength point of view, it is not a good material. However, as it has excellent casting qualities and is economically efficient, cast iron is overwhelmingly used in making castparts. In this respect, nodular cast iron, which has a high toughness, is particularly preferred; in some cases, it has replaced cast steel. Accompanying

the development in fracture mechanics analysis and the establishment of safety standards in designs, tougher cast iron materials are needed. Results of the relevant investigations are presented.

59755 (INIS-mf—7127, pp vp) **CVD - refractory compound coatings for applications in hostile environments.** Hintermann, H.E. (Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59756 (INIS-mf—7127, pp vp) **Surface treatment of metals.** Wilhelmi, H.; Straemke, S. (Rheinisch-Westfaelische Technische Hochschule, Aachen (Germany, F.R.)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 59265, 59494, 59622, 59711, 59712, 59714, 60648

59757 **(CEA-CONF—5902) Neutron scattering studies of the defect structures in TiCsub(1-x) and NbCsub(1-x).** Moisy-Maurice, V.; de Novion, C.H.; Lorenzelli, N.; Christensen, A.N. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. d'Etudes des Combustibles a Base de Plutonium). Aug 1981. 17p. (CONF-810856—3). NTIS (US Sales Only), PC A02/MF A01.

From International conference on the science of hard materials; Moran, WY, USA (23 Aug 1981).

Single crystals of TiCsub(1-x) and NbCsub(1-x) were studied by elastic neutron diffuse scattering at room temperature in the (110) reciprocal lattice plane; the spectra of TiCsub(0.76), TiCsub(0.79) and NbCsub(0.73) were analysed by the Sparks and Borie method, which allowed to determine the first Cowley-Warren short-range order coefficients and a shortening (0.03 A) of the average first neighbour metal-carbon distances. The order-disorder transformation in TiCsub(1-x) ($0.52<=1-x<=0.67$) was studied by high temperature powder neutron diffraction; the transition temperatures (approximately 760-790°C) and critical coefficients β were determined. The results are discussed in terms of interatomic pair potentials.

59758 **(DOE/ER/04075—T2) Coupled diffusion phenomena. Progress report, September 1980-July 31, 1981.** Cooper, A.R. (Case Western Reserve Univ., Cleveland, OH (USA)). Aug 1982. Contract AC02-76ER04075. 15p. NTIS, PC A02/MF A01. Order Number DE82019267.

The major activities have met with success in overcoming some long standing problems. The precision and accuracy of the electron microprobe results have, at last, been sufficient to give self consistent results for all species so that the concentration profiles are interpretable in terms of multicomponent formalism, and give meaningful diffusion paths. The lead oxide activity measurements have been completed in the $PbO-K_2O-SiO_2$ systems. The new method of obtaining K_2O activities in the same system is giving stable results.

59759 (INIS-SU—99, pp 123) **Formation of certain metal carbides in gas-discharge plasma.** Moiseev, G.K.; Popov, S.K.; Ovchinnikova, L.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59760 (INIS-SU—99, pp 119-121) **Plasma reduction synthesis of refractory carbides.** Zhukov, M.F.; Kornilov, A.A.; Tolstoguzov, N.V.; Galevskij, G.V.; Krutskij, Yu.L. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59761 (INIS-SU—99, pp 170) **High-temperature study methods of oxide systems, including $HfO_2(ZrO_2)$.** Shevchenko, A.V.; Lopato, L.M.; Majster, I.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59762 (INIS-SU—99, pp 221) **Interaction of zirconium oxides and rare earths with minerals of periclase-forsterite refractories.** Babin, P.N.; Biryukova, A.A.; Shcheglov, A.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59763 (INIS-SU—99, pp 239) **Study, synthesis and application of materials on the base of zirconium dioxide.** Eliseev, V.B.; Lyutsareva, L.A.; Koposova, Z.L.; Vladimirova, O.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59764 (INIS-SU—99, pp 245) **Cooling of castings of electrofused refractories of complex structure.** Goryajnov, K.E.; Rybalkin, P.T.; Ivanov, S.D.; Schastnyj, A.N.; Beger, D.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59765 (OEFZS—4086, pp M1-M16) **Friction, adhesion and corrosion performance of metallurgical coatings in HTGR-helium.** Engel, R.; Kleemann, W. (Hochtemperatur-Reaktorbau G.m.b.H., Mannheim (Germany, F.R.)). May 1981. Dep. NTIS (US Sales Only).

From IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors; Vienna, Austria (4 May 1981).

The friction-, adhesion-, thermal cycling- and corrosion performance of several metallurgical coating systems have been tested in a simulated HTGR-test atmosphere at elevated temperatures. The coatings were applied to a solid solution strengthened Ni-based superalloy. Component design requires coatings for the protection of mating surfaces, since under reactor operating conditions, contacting surfaces of metallic components under high pressures are prone to friction and wear damage. The coatings will have to protect the metal surface for 30 years up to 950°C in HTGR-helium. The materials tested were various refractory carbides with or without metallic binders and intermetallic compounds. The coatings evaluated were applied by plasma spraying-, detonation gun- and chemical vapor deposition techniques. These yielded two types of coatings which employ different mechanisms to improve the tribiological properties and maintain coating integrity.

59766 (OEFZS—4086, pp N1-N14) **New ceramic coatings for high temperature gas-cooled reactor materials protection.** Bennett, M.J.; Houlton, M.R.; Price, J.B. (UKAEA Atomic Energy Research Establishment, Harwell. Materials Development Div.). May 1981. Dep. NTIS (US Sales Only).

From IAEA specialists' meeting on high-temperature metallic materials for application in gas-cooled reactors; Vienna, Austria (4 May 1981).

The effectiveness of recently developed thin, dense sol-gel ceria and CVD silica coatings to protect the 20% Cr/25% Ni/Nb stabilised austenitic stainless steel has been examined in carbon dioxide at 825°C. Both coatings increased significantly the oxidation and spallation resistance of the steel during extended exposures of up to 15Kh duration. This was not diminished by either thermal fatigue induced by thermal cycling daily or mechanical strain from a continuously applied load. The coatings worked by different mechanisms. The CVD silica coating provided an impermeable barrier to cation diffusion responsible for oxide growth, while the ceria coating by becoming incorporated within the growing oxide, modified its properties beneficially.

59767 (SAND—82-0125C) **Electronic structure of substoichiometric titanium-iron hydride.** Papaconstantopoulos, D.A.; Switendick, A.C. (Sandia National Labs., Albuquerque, NM (USA); Naval Research Lab., Washington, DC (USA)). 1982. Contract AC04-76DP00789. 33p. (CONF-820548—5). NTIS, PC A03/MF A01. Order Number DE82020183.

From International symposium on the properties and applications of metal hydrides; Toba, Japan (30 May 1982).

Portions of document are illegible.

The tight-binding-coherent-potential-approximation method is applied to the study of electronic structure of TiFeH/sub x/. The starting point of these calculations is a Slater-Koster fit to the band structure of TiFe on one end, and to the band structure of $TiFeH_{1.0}$ on the other. The densities of states, decomposed per site and also per angular momentum component, are obtained, as a function of hydrogen content. These densities of states are used to examine the effect of hydrogenation on both the bonding and anti-bonding levels, as well as on the position of the Fermi level.

59768 (SAND—82-1486C) **Comparison of quartz crystals grown from fused silica and from crystalline nutrient.** Baughman, R.J. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 22p. (CONF-820698—2). NTIS, PC A02/MF A01. Order Number DE82019487.

From 36. annual frequency control symposium; Philadelphia, PA, USA (4 Jun 1982).

Synthetic quartz crystals are traditionally grown from a crystalline nutrient. Most of the present crystal growth is from natural quartz nutrient imported from Brazil. This material is handpicked for quality but does not have limited purity levels. The raw material may or may not contain levels of impurities that are detrimental to the intended purpose of the grown crystal. Impurity concentration and species of natural lascus are not uniform or consistent even when produced from the same source of supply. This work reports a comparison of crystals grown in 1978 from a fused silica nutrient and crystalline nutrient in a new autoclave to those recently grown in the same aged autoclave. Several crystal characteristics are discussed. 8 figures, 1 table.

59769 (INIS-mf—7095, pp 179) **Toughening of ceramics, emphasizing the influence of ZrO>=2 inclusions.** Petzow, G.; Claussen, N. (Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany, F.R.). Inst. fuer Werkstoffwissenschaften). [nd]. (In German). Dep. NTIS (US Sales Only).

From 7. international conference on powder metallurgy; Dresden, German Democratic Republic (22 Sep 1981).

Several approaches fo toughening ceramic materials are outlined. One of the most promising is to utilize the tetragonal-to-monoclinic phase transformation of ZrO>=2 particles dispersed in the ceramic matrix. The possible toughening mechanisms for energy dissipation at crack tip are stress-induced transformation, nucleation of microcracks and crack branching. Further strengthening is achieved by introducing steady-state surface compressive stresses. Examples of the toughening effect are given for the ceramic matrices Al>=2O>=3, ZnO, mullite, spinel and Si>=3N>=4. (author).

59770 (INIS-mf—7127, pp vp) **Correlation of plasma-surface region on composition of deposited pyrocarbon.** Inspektor, A.; Carmi, U.; Avni, R. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev); Khait, Y. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Physics). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59771 (INIS-mf—7127, pp vp) **Chemical vapor deposition of silicon on a nickel-base superalloy.** Itzhak, D. (Ben-Gurion Univ. of the Negev, Beersheba (Israel)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59772 (INIS-mf—7127, pp vp) **Deposition by plasma processing (DPP) and CVD in coatings with refractory materials.** Avni, R.; Carmi, U.; Inspektor, A. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59773 (INIS-mf—7127, pp vp) **Deposition of ceramic coatings by a cold RF plasma.** Grill, A.; Itzhak, D.; Katz, M.; Gafri, O.; Avni, R. (Ben-Gurion Univ. of the Negev, Beersheba (Israel)); Inspektor, A. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

3603 Composite Materials

REFER ALSO TO CITATION(S) 59378

59774 (KFTI—80-44, pp 26-30) **Study of radiation damage in prospect composite materials of carbon-carbon type.** Ashrapov, T.B.; Vlasov, K.P.; Kostikov, V.I.; Fedik, I.I.; Razumov, L.L.; Khabibulaev, P.K. (AN Uzbekskoj SSR, Tashkent. Inst. Yadernoj Fiziki). 1980. (In Russian). Dep. NTIS (US Sales Only).

In Radiation damage physics and radiation technology.

Potentialities of using carbon-carbon type structural materials for problems of reactor construction are analyzed. Proceeding from the initial characteristic properties the carbon-carbon compositions have been shown to be preferable by a number of fundamental properties: strength, elasticity modulus, low deformability and others, which control the metal behaviour under irradiation conditions. Presented are the results of irradiation of materials in the VVR-SM reactor up to the fluence of 10^{20} neutron/cm^2 (E>=1.18 MeV) and at the temperature of 400-1800 K. Dimensions, density, microstructure, lattice parameters, electric resistance have been investigated before and after irradiation by the well known methods. No noticeable distortion or other unfavourable effects specific for irradiated pyrographite have been observed.

59775 (UCRL—87821) **Characterization of diaminodiphenyl sulfone (DDS) cured tetraglycidyl 4, 4'diaminodiphenyl methane (TGDDM) epoxies.** Mones, E.T.; Walkup, C.M.; Happe, J.A.; Morgan, R.J. (Lawrence Livermore National Lab., CA (USA)). 14 Jul 1982. Contract W-7405-ENG-48. 12p. (CONF-821010—2). NTIS, PC A02/MF A01. Order Number DE82019239.

From 14. national SAMPE technical conference; Atlanta, GA, USA (12 Oct 1982).

DDS and TGDDM epoxies are currently the most commonly used matrices for high performance fibrous composites. Systematic Fourier - transform infrared spectroscopy (FTIR) studies of the cure reactions of these epoxies are reported as a function of cure conditions, DDS concentration and the presence or absence of BF_3 catalyst. From these studies, the TGDDM epoxide was found to undergo homopolymerization to form either $(CH_2OH)CH$-$CH(CH_2OH)$ or ether linkages in the absence of DDS. Such reactions are accelerated by epoxide impurities and a BF_3 catalyst and also occur in the presence of DDS. For TGDDM-DDS systems epoxide-amine addition reactions occur in which all primary amine and ~ 50% secondary amine groups are consumed. The BF_3 cured systems are more ductile relative to the noncatalyzed systems because they contain less network defects in the form of unreacted epoxide groups. Inhomogeneous mixing of the components together with the catalytic activity of the BF_3 catalyst in commercial TGDDM-DDS epoxies are also discussed.

59776 **(UCRL—87827) Mixed-mode fracture in off-axis unidirectional graphite-epoxy composites.** Wang, A.S.D.; Kishore, N.N.; Feng, W.W. (Lawrence Livermore National Lab., CA (USA); Drexel Univ., Philadelphia, PA (USA)). Jul 1982. Contract W-7405-ENG-48. 9p. (CONF-821023—1). NTIS, PC A02/MF A01. Order Number DE82019108.

From 4. international conference on composite materials; Tokyo, Japan (24 Oct 1982).

Portions of document are illegible.

This paper discusses the results of a fracture experiment, in which matrix-dominant mixed-mode cracks are induced with controlled propagation direction and controlled values of mode-II to mode-I ratio. The test specimens used belong to a class of off-axis, doubly side-notched unidirectional graphite-epoxy composite. By varying the off-axis angle from 0 to 90°, a wide range of mixed-mode cracking conditions are created under a simple uniaxial tension. From the test results the mixed-mode material fracture toughness measured in terms of the critical energy release rate G/sub (I,II)c/ is determined as a continuous function of G/sub II//G/sub I/ ratio.

59777 **Method and composition for molding low-density desiccant syntactic-foam articles.** (to Dept. of Energy). US Patent Application 328,327. 7 Dec 1981. 18p. Contract AC04-76DP00613.

These and other objects of the invention are achieved by a process for molding to size a desiccant syntactic foam article having a density of 0.2 to 0.9 g/cc and a moisture capacity of 1 to 12% by weight, comprising the steps of: charging a mold with a powdery mixture of an activated desiccant, microspheres and a thermosetting resin, the amount of the desiccant being sufficient to provide the required moisture capacity, and the amounts of the microspheres and resin being such that the microspheres/desiccant volume fraction exceeds the packing factor by an amount sufficient to substantially avoid shrinkage without causing excessively high molding pressures; covering the mold and heating the covered mold to a temperature and for an amount of time sufficient to melt the resin; and tightly closing the mold and heating the closed mold to a temperature and for an amount of time sufficient to cure the resin, and removing the resultant desiccant syntactic foam article from the mold. In a composition of matter aspect, the present invention provides desiccant syntactic foam articles, and a composition of matter for use in molding the same.

59778 (INIS-mf—7127, pp vp) **Study of the influence of particle temperature and velocity distribution within a plasma jet coating formation.** Fauchais, P.; Vardelle, A.; Vardelle, M. (Limoges Univ., 87 (France)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59779 (INIS-mf—7127, pp vp) **Plasma flame spraying in Israel.** Shribman, V. (M.T.C. Carmiel (Israel)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59780 (INIS-mf—7127, pp vp) **Plasma-spray coating processes: Physico-mathematical characterization.** Gal-Or, B. (Technion-Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59781 (INIS-mf—7127, pp vp) **Ion implantation as a surface treatment technique.** Kalish, R. (Technion-Israel Inst. of Tech., Haifa. Solid State Inst.). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

59782 (INIS-mf—7127, pp vp) **DC Plasma spraying at low pressures.** Steffens, H.D.; Hoehle, H.M. (Dortmund Univ. (Germany, F.R.)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 59183, 60215, 60671

59783 **(LA—9447-T) Effects of spherical fillers on the viscosity of short-fiber reinforced plastics.** Schutz, J.B. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 169p. NTIS, PC A08/MF A01. Order Number DE82021843.

Thesis. Submitted to Massachusetts Inst. of Tech., Cambridge. Portions of document are illegible.

An experimental study was carried out to measure the viscosity of suspensions of glass fibers and spheres in a silicone oil. The fibers had a fiber length distribution which was approximately log-normal, with an arithmetic mean fiber Length to Diameter ratio of 17.8. Three sizes of spheres were chosen to illustrate the effect of the apparent volume of a dry mixture of fibers and spheres on the viscosity of a suspension made with those same fibers and spheres. The sphere diameter to fiber diameter ratios, also known as R, were 0.5, 2, and 7. The use of the R = 0.5 spheres minimized the apparent volume when mixed with the fibers, while the use of the R = 7 spheres maximized the apparent volume of the solids. The R = 2 sphere/fiber mixture is intermediate. The ratio of volume of fibers to the volume of solids (fibers and spheres) was varied from zero to one, while the total volume of solids was held constant at 15%. The viscosity was measured at shear rates from about 12 to 4500 (1/sec).

59784 **(SAND—82-0663) Removable foam encapsulants.** Wischmann, K.B. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 7p. (CONF-821010—1). NTIS, PC A02/MF A01. Order Number DE82017026.

From 14. national SAMPE technical conference; Atlanta, GA, USA (12 Oct 1982).

Portions of document are illegible.

This paper describes the use of two different expandable bead foams as solvent removable encapsulants; specifically they are polystyrene (STYROPOR BF-414, BASF Wyandotte) and a styrene-emaleic anhydride copolymer (DYTHERM X214, ARCO/Polymers). These expandable bead foams are commercially available and normally used in insulating applications. However, they have been adapted to the unusual task of encapsulating sophisticated and expensive electronic hardware which requires a rework capability. The respective foams processing, resultant properties and removal methods are discussed in detail in this paper.

59785 **(UCRL—86894) Crystallinity as a selection criterion for engineering properties of high-density polyethylene.** Hoffman, D.M.; McKinley, B.M. (Lawrence Livermore National Lab., CA (USA)). 1982. Contract W-7405-ENG-48. 13p. (CONF-820809—4). NTIS, PC A02/MF A01. Order Number DE82020496.

From 7. international conference on thermal analysis; Kingston, Canada (22 Aug 1982).

Based on DSC measurements of T/sub m/ and ΔH/sub f/, eight polyethylenes of 0.96 g/cc calculated density were selected from 25 commercial HDPEs for further comparison of their properties against four design requirements. According to preliminary results from thermal expansion and creep measurements, DSC studies correctly predict the HDPE samples with superior design required properties. Clearly, the DSC was useful for screening and studying HDPE crystallization, the polymer crystal being the major physical structure responsible for improvement in three of the four design required properties. The Avrami equation proved useful for evaluating the overall crystallization kinetics of the HDPE specimens selected for their high crystallinity and melting point.

59788 **(UCRL—87546) Curing behavior of seven segmented polyurethane adhesives.** Hoffman, D.M. (Lawrence Livermore National Lab., CA (USA)). 1 Jun 1982. Contract W-7405-ENG-48. 11p. (CONF-820909—8). NTIS, PC A02/MF A01. Order Number DE82020847.

From National meeting of the American Chemical Society; Kansas City, MO, USA (1 Sep 1982).

The curing behavior of seven segmented polyurethane adhesives (Halthanes) was followed by dynamic viscosity measurements with time under isothermal conditions. Two types of adhesive systems were studied: (1) MDI/ BDO/ PTMG1 or 4,4' methylene bis (phenylisocyanate)/ butanediol/ poly(tetramethylene oxide) and (2) HMDI/ ADA/ PTMG2 or 4,4' methylene bis (cyclohexylisocyanate)/ aromatic diamine/ poly(tetramethylene oxide). Changing the hard segment former from MDI/BDO to HMDI/ADA significantly increased the cure rate. The accelerator, ferric acetoacetonate, used in combination with a tetrafunctional alcohol increased the cure rate of the MDI adhesive system to nearly that of the HMDI system. With increasing temperature, macroscopic phase separation of the excess MDI in the MDI terminated prepolymer is compatibilized by the curing agent. Thus MDI/BDO/ PTMG1 systems are clear when cured at above 80°C. This does not affect the hard-soft block structure which controls the adhesive properties. All components of the HMDI/ ADA/ PTMG2 systems can be compatibilized at 60°C and will remain dissolved for several hours at room temperature. Therefore, these systems are dark but clear when cured. 4 figures.

3606 Other Materials

REFER ALSO TO CITATION(S) 59308, 59308, 59309, 59368, 59615, 59616, 60311, 60510, 60511, 60649

59787 **(BNL—31574) Study of III-V semiconductor band structure by synchrotron photoemission.** Williams, G.P.; Cerrina, F.; Anderson, J.; Lapeyre, G.J.; Smith, R.J.; Hermanson, J.; Knapp, J.A. (Brookhaven National Lab., Upton, NY (USA); Montana State Univ., Bozeman (USA). Dept. of Physics). 1982. Contract AC02-76CH00016. 3p. (CONF-820937—1). NTIS, PC A02/MF A01. Order Number DE82016331.

From 16. international conference on the physics of semiconductors; Montpellier, France (6 Sep 1982).

Portions of document are illegible.

Angle-resolved synchrotron photoemission studies of six III-V semiconductors have been carried out. For emission normal to the (110) plane of these materials, peaks in the experimental spectra were identified with the bands involved in the transitions, and the critical point energies X_3, X_5, and Σ_1/sup min/, were determined. The data indicate that k perpendicular is conserved in the transitions. Comparison of the data with theoretical bands permits an evaluation of k perpendicular associated with the experimentally observed transition, and from this information the bands were plotted out.

59788 **(BNL—31578) Synchrotron x-ray study of physisorbed films of mixtures of Ar and Xe on graphite.** Bohr, J.; Nielsen, M.; McTague, J.P.; Als-Nielsen, J.; Kjaer, K. (Brookhaven National Lab., Upton, NY (USA); Risoe National Lab., Roskilde (Denmark)). Jul 1982. Contract AC02-76CH00016. 12p. (CONF-820744—1). NTIS, PC A02/MF A01. Order Number DE82019349.

From 2. international symposium on statistical mechanics of adsorption; Trieste, Italy (1 Jul 1982).

Mixtures of Ar and Xe have been studied in most of the submonolayer region of the phase diagram (T,chi,rho), T = temperature, chi = chemical composition, rho = fraction of a monolayer. The basic feature is a large tendency to form $\sqrt{3} \times \sqrt{3}$ commensurate alloys (Kr-like structures), but none of the commensurate nor of the incommensurate structures form a chemically ordered alloy at 11 K. Thus the 2D solid can be thought of as a solid consisting of particles of an average size. This allows the study of commensurate-incommensurate phase transition driven by average particle size. The transition is indeed a sharp first order transition taking place through coexisting phases (tau/sub A/ = 1.64 A^{-1} and tau/sub B/ = 1.703 A^{-1}), as was the case for the low temperature pure Kr-system. Another interesting feature is the existence of well correlated liquid-like structures which preserve their correlation over a temperature range of 5 Kelvin or more. This unusual behavior is for chemical compositions where there is coexistence of a commensurate and an incommensurate solid at high temperature.

59789 **(INIS-mf—7072) Equation of state for the viscosity of water and steam.** El-Rafey, M.E.E. (Stuttgart Univ. (TH) (Germany, F.R.)). 21 Jul 1980. 126p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780679.

Thesis.

In the present study an empirical equation of state is to be developed for the viscosity of water in the entire fluid range. In most of the known equations for the viscosity of water the main variables are temperature and density and in addition, a considerable number of constants. On principle density is an unconvenient independent variable because it is not specified in technical processes, but must be calculated by iteration from a thermal equation of state. Moreover, at high densities viscosity very strongly depends on density. Small inaccuracies of the calculated density therfore may cause considerable errors in viscosity. Therefore in the present paper an equation using the variables temperature and pressure is to be elaborated. For this purpose it is appropriate to choose the formulation of the equation for the viscosity in the implicit form p(T,rho), similar to the thermal equation of state p(T,rho). The new equation is intended to represent the large number of measured values for the viscosity of water and steam with sufficient accuracy, i.e. if possible within the tolerance of the skeleton table, regression analysis being intended to be used as a means for setting up the equation.

59790 **(KFTI—80-44, pp 35-38) Structural changes in silicon under gamma irradiation.** Soloshenko, I.I.; Malets, E.B.; Myalova, E.M. (Khar'kovskij Pedagogicheskij Inst. (Ukrainian SSR)); Kas'yan, M.M. (Zaporozhskij Industrial'nyj Inst. (Ukrainian SSR)); Lemberg, E.A.; Stratienko, V.A.; Tkach, Yu.V. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

In Radiation damage physics and radiation technology.

The effect of γ-irradiation on the structure of n-type silicon with a resistivity of 0.35 and 40 Ohmxcm has been studied by the IR-spectroscopy and internal friction methods. The 0.2 MeV γ-quanta irradiation of silicon (rho approximately equal to 40 Ohmxcm) has been found to lead to an increase in absorption in the 400-1000 cm^{-1} range. A comparison of the results obtained on the IR spectroscopy and on internal friction makes it possible to conclude that irradiation causes redistribution of point defects of the heterogeneous inclusion type in the silicon crystal lattice.

59791 **Electropositive bivalent metallic ion unsaturated polyester complexed polymer concrete.** Sugama, T.; Kukacka, L.E.; Horn, W.H. (to Dept. of Energy). US Patent Application 318,080. 4 Nov 1981. 21p. Contract AC02-76CH00016.

Quick setting polymer concrete compositions which are mixtures of unsaturated polyesters and crosslinking monomers together with appropriate initiators and promoters in association with aggregate which may be wet and a source of bivalent metallic ions which will set to polymer concrete with excellent structural properties.

40 CHEMISTRY

59792 **(INIS-SU—86) Neorganical chemistry and technology of neorganic substances. Radiochemistry. Analytical chemistry. Coordination chemistry. Annotations of reports and communications. No. 1.** (AN SSSR, Moscow). 1981. 467p. (In Russian). NTIS (US Sales Only), PC A20/MF A01. Order Number DE82780634.

Individual papers in scope for the data base are processed separately. (DLC)

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 59133, 59233, 59260, 59268, 59270, 59296, 59331, 59748, 59854, 59886, 59889, 60087, 60109, 60142

59793 (ACC—183) Actual methods of nuclear physics in the analysis of the elemental composition of rocks and minerals. Leonard, M.; Tsipenyuk, Yu. M. (Academia de Ciencias de Cuba, La Habana. Inst. de Investigaciones Nucleares). 1981. 25p. (In Spanish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702636.

In this paper two methods are described for the Nuclear Physical analysis of the elementary composition of ores, mineral rocks and principles, elementary particles and radiation sources. Some examples are given showing their applications, high sensibility, selectivity, quickness and economy in comparison with other analytical methods. They are classified by their sensibilities among other analytical techniques in the determination of a large quantity of elements.

59794 (BDX—613-2648) End-of-process detection for plasma cleaning. Smith, M.D. (Bendix Corp., Kansas City, MO (USA)). Jun 1982. Contract AC04-76DP00613. 29p. (CONF-820387—1). NTIS, PC A03/MF A01. Order Number DE82020086.

From Microelectronics measurement and test conference; San Jose, CA, USA (23 Mar 1982).

Activated gas plasma is being used extensively to remove trace organic contamination from electromechanical components prior to final assembly. Optical emission techniques are being used throughout the electronics industry to determine end-points of plasma processes for removing large amounts of different materials such as photo-resist and silicon and aluminum compounds. A project was undertaken for the application of these techniques to detect the removal of trace organic residues. These techniques gave a definite end-point and their application to detect the removal of trace organic residues was shown to be possible using a process monitor. Removal of organic contamination as low as 0.5 mg total was detected in an oxygen plasma. Auger analysis confirmed the cleanliness levels indicated by the end-point detector tested. The simplicity of this type of process monitor lends itself to production line use for the plasma cleaning of various parts and batch sizes. The monitoring of argon plasma cleaning processes using optical emission techniques has also been investigated. 22 figures.

59795 (DOE/ER/10554—14-Rev.1) Use of mixed phases for enhanced gas-chromatographic separation of polycyclic aromatic hydrocarbons. III. Phase-transition behavior, mass-transfer non-equilibrium, and analytical utility of mesogen solvents. Finkelmann, H.; Laub, R.J.; Roberts, W.L.; Smith, C.A. (Ohio State Univ. Research Foundation, Columbus (USA). Dept. of Chemistry). Aug 1982. Contract AC02-80ER10554. 15p. NTIS, PC A02/MF A01. Order Number DE82020763.

Previous studies of the gas-chromatographic separation of polycyclic aromatic hydrocarbons have shown that open-tubular (capillary) columns containing liquid crystal solvents in admixture with silicone gums exhibit both high efficiency and high selectivity. Detailed here, for the first time, are selected analytical and physicochemical properties of a representative example of a unique class of phases which comprise silicone polymers with mesogenic side-chains. The retentions and relative separations achieved with the polymer resemble those found with a blend of 20% (w/w) BBBT with SE-52. However, the polymer exhibits a higher useful temperature range, lower volatility, and higher column efficiency. Relative retentions (alpha values) can differ by as much as a factor of three over a five-degree temperature range, and blending the mesogenic polymer with silicone diluents lowers the nematic transition temperature by as much as eighty degrees. The properties of mesogenic silicones thus provide an unprecedented spectrum of adjustable parameters for the quantitative control of solute retention and retention order, that is, means of optimization of separations.

59796 (DOE/ER/10554—19-Rev.1) Program WINDOW. Laub, R.J. (Ohio State Univ. Research Foundation, Columbus (USA). Dept. of Chemistry). Aug 1982. Contract AC02-80ER10554. 52p. NTIS, PC A04/MF A01. Order Number DE82020760.

Portions of document are illegible.

The program described was written for the reduction of retention data encountered in liquid chromatography. The program considers that log (solute retentions) vary in a linear fashion with LC mobile-phase composition. However, any function (e.g., quadratic, etc.) could easily be substituted and the program will perform equally as well. A particularly important feature of the current program comprises a loop which identifies the relevant pairs of solutes (within a given value of inputted alpha) which are used subsequently to calculate the window-diagram boundary. The program run time is consequently shortened by at least a factor of five over previously-used brute-force techniques (all possible pairs considered at each column composition). The required CPU space reserved for arrays is also thereby diminished considerably. The program was written on and for an APPLE II Plus system; statements not compatible with other modern versions of BASIC are pointed out and discussed.

59797 (DOE/ER/10554—24) Fabrication and evaluation of gas-chromatographic systems of high efficiency with concomitant high selectivity. Roberts, W.L. (Ohio State Univ., Columbus (USA). Dept. of Chemistry). Aug 1982. Contract AC02-80ER10554. 81p. NTIS, PC A05/MF A01. Order Number DE82020758.

Thesis. Portions of document are illegible.

Glass-capillary columns which provide high efficiency and short analysis times can be fabricated by decreasing the inner column diameter. The sample capacity of the column used with a G C equipped with a flame ionization detector dictates the lower limit of usable diameters. The inlet pressure required to produce the optimum linear velocity increases rapidly with decreasing column diameter. Such an instrument equipped with a 25m 35μm column would be useful for separating rapidly complex hydrocarbon mixtures. Nematic mesogenic polymers were prepared which were highly selective for polynuclear aromatic hydrocarbons. Three of these polymers exhibited nematic phases in the temperature range required for separating compounds commonly encountered in environmental analyses. The selectivity of these phases can be modified by blending with a boiling-point stationary phase such as SE-52. The optimum stationary-phase composition for a specific separation can then be determined with a window diagram. Areas for possible further development are pointed out. 20 figures, 5 tables.

59798 (DOE/ER/10554—25) Novel mesogenic polysiloxane solvents for gas-liquid chromatography. Finkelmann, H.; Laub, R.J. (Ohio State Univ. Research Foundation, Columbus (USA). Dept. of Chemistry). Aug 1982. Contract AC02-80ER10554. 22p. NTIS, PC A02/MF A01. Order Number DE82020753.

The open-tubular column gas-chromatographic properties of a member of a new class of mesogenic polysiloxane (PMMS) phases are described and compared with those of a polymethylphenylsiloxane solvent (SE-52). The former is shown to yield high column efficiency commensurate with its gum-like character, yet concomitant high selectivity for positional isomers of methylchrysenes and for polycyclic aromatic and sulfur heteronuclear compounds. The nematic/isotropic temperature range of the new phase, 70° to 300° C, exceeds by several factors those of previously-described liquid-crystal stationary solvents, as does its upper useful temperature limit of 300°C.

59799 (INIS-mf—6311, pp 233-244) Influence of matrix on the determination of trace amounts by means of the activation analysis. Gerstenberger, Kh.; Gejsler, M.; Shel'khorn, Kh. (Akademie der Wissenschaften der DDR, Leipzig. Zentralinstitut fuer Isotopen- und Strahlenforschung). 1979. (In Russian). Dep. NTIS (US Sales Only).

From Symposium on the radioisotope methods application in industry, including means of control and operation; Leipzig, German Democratic Republic (26 Sep 1978).

In activation analysis the influence of the matrix is understood to be the dependence of the measured signal from other components of a sample then except from the component being measured. Influence of matrix in the activation analysis is small, because nuclear reactions are independent of the chemical composition of the surrounding nuclei, but the radius of action of thermal neutrons and gamma-rays is big compared to the dimensions of a sample. Nevertheless, in definite cases, it is necessary to take into consideration the matrix investment into the measured signal. Problems are discussed of the influence of parasitic nuclear reactions in the activation of matrix; criterion is discussed for choice of suitable method of chemical separation; technique of the gamma-spectroscopic measurements is discussed taking into consideration influence of the matrix nuclides. Because the matrix effects are negligible, and also because it is possible and relatively simple to eliminate these effects, activation analysis can be applied to determination of trace element concentrations with high enough thrustworthiness of results. For the same reason, the activation method is used as a calibration method and also during other analytical investigations.

59800 (INIS-mf—6311, pp 288-295) **Bromine content determination in aqueous solutions by the method of noncrystallic X-ray fluorescence analysis.** Shikel, M.; Irmer, K. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik); Chekhak, T.; Sheda, J. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From Symposium on the radioisotope methods application in industry, including means of control and operation; Leipzig, German Democratic Republic (26 Sep 1978).

In the industrial production of bromine, as a raw material, a potassium salt solution extraction is used. Optimum control of the bromine extraction process demands strict knowledge of the bromine content in the solution. X-ray radiometric analysis was applied for determination of the bromine content in the aqueous solutions. Radioisotope cadmium-109 was used as a source of exciting radiation. For detection of the X-ray radiation, excited in the analysed sample, scintillation detector, proportional counter and semiconductor detector were tested. To increase spectrum lines separation in the application of the scintillation detector and the proportional counter, differential filters were used. Experimental results show that all detectors investigated are suitable for the analysis of bromine in aqueous solutions. The limits, obtained for measured concentrations lie in the range from 10 to 70 g/1 with time of measurement in the limits from 600 to 2000 sec. Absolute errors in the range of bromine concentrations from 0.1 to 10 g/1 equal to less than 0.1 g/1.

59801 (INIS-mf—7059(v.2), pp vp) **Surface boron concentration of Nisub(x)Fesub(80-x)B_{20} samples.** Kristiakova, K.; Kristiak, J. (Slovenska Akademia Vied, Bratislava (Czechoslovakia). Fyzikalny Ustav); Kritek, J.; Cervena, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). 1981. Dep. NTIS (US Sales Only).

From International conference on amorphuos systems investigated by nuclear methods; Balatonfuered, Hungary (31 Aug 1981).

59802 (INIS-SU—86, pp 176) **Scientific fundamentals and practical results of application of chromatography to separation of radiative elements.** Nazarov, P.P.; Belov, V.V.; Chuveleva, E.A.; Masloca, G.B.; Gelis, V.M.; Kharitonov, O.V.; Kudryavtseva, S.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59803 (INIS-SU—86, pp 177) **Chromatographic separation of transplutonium elements.** Elesin, A.A.; Nikolaev, V.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59804 (INIS-SU—86, pp 178) **Investigation into processes of sorption concentrating during uranium separation from sea water.** Novikov, Yu.P.; Komarevskij, V.M.; Myasoedov, B.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59805 (INIS-SU—86, pp 179) **Separation of uranium from solutions by inorganic sorbents.** Nuriev, A.N.; Shik, E.I.; Kuliev, A.A.; Abdullaeva, R.S.; Mamedov, R.M.; Mamedova, Z.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59806 (INIS-SU—86, pp 181-182) **New achievements in investigations on the influence of the structure of organic compounds on their extraction power during actinide separation.** Rozen, A.M.; Nikolotova, Z.I.; Kartasheva, N.A.; Skotnikov, A.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59807 (INIS-SU—86, pp 183) **Processes of separation of transplutonium elements from various irradiated materials.** Nikolaev, V.M.; Karelin, E.A.; Filimonov, V.T.; Gordeev, Ya.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59808 (INIS-SU—86, pp 184) **Investigation into possibility of transuranium element separation from nitric-acid solutions by nitrogen-containing organic phosphorus compounds.** Dedov, V.B.; Kalinichenko, B.S.; Bebikh, G.F.; Godovannaya, L.D.; Kulazhko, V.G.; Trukhlyaev, P.S.; Nasonovskij, I.S.; Troitskaya, L.M.; Shvetsov, I.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59809 (INIS-SU—86, pp 184-185) **Solvent extraction of berkelium (4) by high-molecular amines and neutral organic phosphorus compounds from inorganic acid solutions.** Myasoedov, B.F.; Milyukova, M.S.; Malikov, D.A.; Kuzovkina, E.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59810 (INIS-SU—86, pp 185) **New methods to separate and purify berkelium.** Kosyakov, V.N.; Yakovlev, N.G.; Kazakova, G.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59811 (INIS-SU—86, pp 187) **Gas radiochromatography of β-diketonates of actinide and lanthanide elements in vapors of β-diketones.** Davydov, A.V.; Myasoedov, B.F.; Fedoseev, E.V.; Travnikov, S.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59812 (INIS-SU—86, pp 188) **Gas-chemical separation of oxides and elements of the periodic system and possibility of identification of superheavy elements.** Zhujkov, B.L. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59813 (INIS-SU—86, pp 188-189) **Extraction methods to separate radioactive isotopes from irradiated targets.** Nesmeyanov, A.N.; Iofa, B.Z.; Makagonova, L.N.; Abramov, A.A.; Dzhigarzhanov, M.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59814 (INIS-SU—86, pp 189-190) **Sorption extraction of radioisotopes by ion-exchange fibers.** Sedov, V.M.; Ovsyannikov, A.I.; V'yunov, A.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59815 (INIS-SU—86, pp 191) **Use of sorption of anions of the $MeHaL_4^-$ with sulfo-cationites for purification and concentration of radioisotopes.** Zajtseva, N.G.; Norseev, Yu.V.; Khalkin, V.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59816 (INIS-SU—86, pp 192) **Separation of radioisotopes from melts of irradiated media by the method of molecular distillation.** Ershova, Z.V.; Petrov, B.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59817 (INIS-SU—86, pp 193) **Concentration of radioisotopes by flotation.** Evtyukhova, O.V.; Berezyuk, V.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59818 (INIS-SU—86, pp 197-198) **Possibilities of use of the sorption method to separate analogs of superheavy elements from geothermal waters.** Paramonova, V.I.; Akulov, G.P.; Bartenev, S.A.; Klemina, A.M.; Kharitonov, V.V.; Usacheva, N.T.; Zhuravleva, E.L.; Kul'kina, L.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59819 (INIS-SU—86, pp 198-199) **Kinetic method in radiochemical analysis of lanthanoids, actinoids and some other elements.** Stepanov, A.V.; Nikitina, S.A.; Makarova, T.P.; Fridkin, A.M.; Dem'yanova, T.A.; Nemtsova, M.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59820 (INIS-SU—86, pp 288-289) **Peculiarities of concentration and determination of trace quantities of elements.** Markov, V.K.; Astafurov, V.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59821 (K/TL/AT—148) **Determination of ^{235}U and ^{238}U concentration in spherical aluminum oxide trap material by the random-driver technique.** Kirkpatrick, C.R.; Pierce, G.V. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Aug 1982. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE82020695.

Eight 5-gal cans of contaminated spherical aluminum oxide (Al_2O_3) were evaluated to ascertain the validity and/or reliability of the Random Driver's determination of the ^{235}U and ^{238} concentrations. The evaluation was carried out by comparing the chemically isotopically obtained grams ^{235}U and ^{238}U with the Random Driver acquired net counts per 1000 sec. The data shows the Random Driver to be an applicable method and the determinations made by it to be valid and reliable. 4 figures, 3 tables.

59822 (LBL—14528) **Structure of surfaces of interfaces.** Gronsky, R. (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 18p. (CONF-820846—1). NTIS, PC A02/MF A01. Order Number DE82019302.

From 10. international congress on electron microscopy; Hamburg, F.R. Germany (17 Aug 1982).

It has been only relatively recently that electron microscopy has demonstrated its potential for the complete (atomic level) determination of surface and interfacial structure. For years, surfaces were studied exclusively with scanning systems and interfaces with transmission system and were constantly and drastically modified by the hostile vacuum environments of electron-optical columns; this is no longer true. Local deviations in bulk crystalline order which represent defects were also frequently beyond the resolution limits set by probe size or lens aberrations, but this is thankfully no longer a limitation. Since the least International Congress, applications of electron microscopy have brought the study of surface and interfacial structure much closer to the atomic level. Purpose of this review is to identify some of these recent developments, summarize their application to the microstructural analysis of surfaces and interfaces and indicate where they have made new contributions to the science of materials. 36 references, 6 figures.

59823 (MLM—2978) **Fundamental radioanalytical calculations.** Bishop, C.T. (Mound Facility, Miamisburg, OH (USA)). 30 Aug 1982. Contract AC04-76DP00053. 14p. NTIS, PC A02/MF A01. Order Number DE82021901.

This report is a compilation of fundamental radioanalytical calculations. The units of decay rate of a radioisotope, the curie and the becquerel and their relationship to each other are discussed. Likewise the relationship between the absolute disintegration rate and the counting rate is accurately defined. Equations for calculating the decay and the specific activity of a radioisotope are given. Concentrations of radioisotopes in environmental samples are discussed briefly, and finally equations for calculating counting statistics errors are given.

59824 (SAND—82-1792C) **Pulsed-laser atom probe: recent applications.** Kellogg, G.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-820841—2). NTIS, PC A02/MF A01. Order Number DE82020093.

From 29. international field emission symposium; Goteborg, Sweden (9 Aug 1982).

A new approach to time-of-flight atom-probe mass spectroscopy was introduced in 1979 with the development of the photon induced field ionization mass spectrometer and the pulsed laser atom-probe. These techniques, which were independently developed, differed from conventional atom-probes in that the field evaporation of surface species was initiated with a short duration laser pulse and a dc electric field, rather than a high voltage electrical pulse. This approach has been shown to have several advantages. Two recent applications which exploit some of these advantages are described. The first, a study of insulating glasses, demonstrates the applicability of the pulsed laser atom-probe to high resistivity materials. The second, a study of the field dependence of the charge state distributions of field evaporated ions, utilizes the capability of the pulsed laser technique to carry out field evaporation measurements as a function of the applied electric field. The results of this latter study have been found to be consistent with recently proposed postionization models of field evaporation.

59825 (SSA—1981-TS-2, pp 551-553) **Comparison of solvent extraction and ion exchange resin methods for determination of plutonium with or without uranium in urine.** Landrin, M.; Wallach, P.H.; Perrault, G.H. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France)). Aug 1981. (In French). NTIS (US Sales Only), PC A99/MF A01.

In 1980 Scientific works.

59826 (UCRL—50400-Vol.22-Rev.1) **GAMIDEN: a program to aid in the identification of unknown materials by gamma-ray spectroscopy.** Howerton, R.J. (Lawrence Livermore National Lab., CA (USA)). 25 Jun 1982. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01. Order Number DE82021960.

The intent of the computer code GAMIDEN is to help identify isotopes by their gamma-ray emissions and thus to assist in the nondestructive assay of unknown materials. From both radioactive decays and neutron captures, GAMIDEN searches GAMTOT78, a file of gamma-ray spectra, for matches with observed photon energies. This report describes the search procedure,

outlines the use of the code, and gives an example. The code is designed to operate on the CRAY 1 computer at Lawrence Livermore National Laboratory (LLNL). It is written in standard Fortran (ANSI) for the most part but contains some LRLTRAN instructions to make use of the Livermore time-sharing system (LTSS). The code uses about 545,000 words of memory. Typical problems run in about 45 s. The source program and the data file are available on request.

59827 **(UCRL—87780) Microspectroscopy.** Hirschfeld, T. (Lawrence Livermore National Lab., CA (USA)). 1 Jul 1982. Contract W-7405-ENG-48. 19p. (CONF-820807—3). NTIS, PC A02/MF A01. Order Number DE82020158.

From 16. annual meeting of the Microbeam Analysis Society; Washington, DC, USA (9 Aug 1982).

The boom in electron and ion microbeam methods, with its overwhelming proliferation of new methods (and acronyms) and eager exploitation of every available technological advance, has tended to obscure the very wide usage of the corresponding optical methods. These outgrowths of the enormous field of visual optical microscopy are, however, quite alive and kicking, and their unique capabilities are becoming more appreciated as more and more advanced optical technology is being applied to the field. This review of optical microprobe techniques includes uv-VIS absorption techniques, fluorescence microspectroscopy, Raman measurements, and other microprobes such as the infrared ones, scatter, and the various partially optical methods. Also discussed are technological advances that may impact these fields. The natural place of microspectroscopy is shown to be as a higher discrimination, lower resolution companion of electron and ion beam microprobes.

59828 (ZFI-Mitt—39, pp 21-30) **Rapid analysis by x-ray fluorescence excitation.** Bothe, H.K. Jun 1981. (In German). NTIS (US Sales Only), PC A08/MF A01.

From KDT meeting on isotopes for rationalization in industry; Leipzig, German Democratic Republic (4 Jun 1980).

The application of the energy dispersive X-ray fluorescence spectrometry for a quick multielement analysis of different samples (sedimented dust, motor oil, watery solutions) is discussed. Using a source of 30 mCi ^{239}Pu for the X-ray excitation it is possible to determine the concentration of the elements Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Br, Sr, and Pb in a single working operation with a detection efficiency between 1000 ppm for Ca and about 10 ppm for Zn, Br, Sr and Pb using a testing time of 1000 seconds.

59829 (ZFI-Mitt—39, pp 127-148) **Determination of air pollution using the analytical methods.** Grosse, H.J.; Bothe, H.K.; Brunner, G.; Geisler, M.; Popp, P. Jun 1981. (In German). NTIS (US Sales Only), PC A08/MF A01.

From KDT meeting on isotopes for rationalization in industry; Leipzig, German Democratic Republic (4 Jun 1980).

Methods of determining air pollution (gas, dust, etc.) using analytical methods are demonstrated. Measuring techniques modified by the ZfI and the advanced equipment developed for this purpose are described, and their parameters and characteristics given. Practical experiences are evaluated using examples of application, and these are discussed with a view to possible future developments.

59830 **(ZfI-Mitt—41) Chemistry of nitrogen isotopes.** (Akademie der Wissenschaften der DDR, Leipzig. Zentralinstitut fuer Isotopen- und Strahlenforschung). Oct 1981. 248p. (In German). NTIS (US Sales Only), PC A11/MF A01. Order Number DE82780639.

Selected papers have been indexed separately.

59831 **(RFP-Trans—332) Method of determining tributyl phosphate in a mixture of tributyl phosphate and kerosene.** Shilin, I.V.; Indikov, E.M.; Zhdanov, Yu.F.; Makarov, G.V. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). Aug 1982. Contract AC04-76DP03533. Translation of USSR Patent No. 114,186. 3p. NTIS, PC A02/MF A01. Order Number DE82020403.

A method is claimed for determining tributyl phosphate in a mixture of tributyl phosphate-kerosene mixture. The method is based on the formation of a complex upon addition of perchloric acid. The complex has the following composition, $HClO_4.1.5(C_4H_9O)_3PO$, and is insoluble in kerosene and in excess perchloric acid. The amount of tributyl phosphate is established by the volume of the middle layer formed under pressure of 1 part by volume of 9N perchloric acid to four volumes of mixture being analyzed.

59832 **(RFP-Trans—333) Method of determining tributyl phosphates.** Goriainov, N.E. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). Aug 1982. Contract AC04-76DP03533. Translation of USSR Patent No. 188,124. 5p. NTIS, PC A02/MF A01. Order Number DE82020404.

A method is claimed for determining tributyl phosphates in kerosene in the presence of di-(2-ethylhexyl)-phosphoric acid according to the volume of the middle layer formed during treatment of the mixture being analyzed with a mineral acid. For the purpose of simplifying the analysis of equimolar industrial mixtures, a solution of tributyl phosphate in kerosene of known concentration is added to the mixture being analyzed, the tributyl phosphate content in the separated middle phase of intermediate mixture is determined, and the material balance equation is used to calculate the tributyl phosphate content of the mixture analyzed.

59833 **(RFP-Trans—331) Method for analytical determination of extracting agents.** Shesterikov, N.N.; Pentin, Yu.A.; Tetrin, E.G. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). Jul 1982. Contract AC04-76DP03533. Translation of USSR Patent No. 142,809. 4p. NTIS, PC A02/MF A01. Order Number DE82020380.

A spectrophotometric method is proposed for determining tributyl phosphate and diisoamyl ester of methylphosphonic acid in solvents such as saturated hydrocarbons and kerosene within concentration limits of 0.1 to 0.6% (by volume) and higher for the given compounds. The method consists of measuring the optical density in the solutions being analyzed at preselected wavelengths in the infrared region of the spectrum and determining the concentration using calibration diagrams. The accuracy of the analysis is considerably greater than that of the chemical method. The error of determination ranges from 4 rel. % at concentrations on the order of 10% to 8 rel. % at concentrations on the order of 0.01%. Sensitivity of determination is two orders of magnitude greater than for the known method and corresponds to the absolute sensitivity of 8 mg tributyl phosphate. The proposed method is simple. The procedure can be carried out on any infrared spectrometer.

59834 **State-of-the-art in situ determination of transuranics.** Brodzinski, R.L. (Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352). *Transactions of the American Nuclear Society;* **41**: 234(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

59835 **Method of uranium reclamation from aqueous systems by reactive ion exchange.** Maya, L. (to Dept. of Energy). US Patent Application 318,668. 5 Nov 1981. 18p. Contract W-7405-ENG-26.

A reactive ion exchange method for separation and recovery of values of uranium, neptunium, plutonium, or americium from substantially neutral aqueous systems of said metals comprises contacting said system with an effective amount of a basic anion exchange resin of copolymerized divinyl-benzene and styrene having quarternary ammonium groups and bicarbonate ligands to achieve nearly 100% sorption of said actinyl ion onto said resin and an aqueous system practically free of said actinyl ions. The method is operational over an extensive range of concentrations from about 10^{-6} M to 1.0 M actinyl ion and a pH range of about 4 to 7. The method has particulr application to treatment of waste streams from Purex-type nuclear fuel reprocessing facilities and hydrometallurgical processes involving U, Np, P, or Am.

59836 **(LARN—803) Large scale study of tooth enamel.** Bodart, F.; Deconninck, G.; Martin, M.T. (Facultes Universitaires Notre-Dame de la Paix, Namur (Belgium)). [nd]. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702637.

Human tooth enamel contains traces of foreign elements. The presence of these elements is related to the history and the environment of the human body and can be considered as the signature of perturbations which occur during the growth of a tooth. A map of the distribution of these traces on a large scale sample of the population will constitute a reference for further investigations of environmental effects. On hundred eighty samples of teeth were first analyzed using PIXE, backscattering and nuclear reaction techniques. The results were analyzed using statistical methods. Correlations between O, F, Na, P, Ca, Mn, Fe, Cu, Zn, Pb and Sr were observed and cluster analysis was in progress. The techniques described in the present work have been developed in order to establish a method for the exploration of very large samples of the Belgian population.

59837 **(LARN—804) Chemical effects in the pixe analysis of fluorine.** Deconninck, G.; van den Broek, S. (Facultes Universitaires Notre-Dame de la Paix, Namur (Belgium)). [nd]. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702638.

Spectra of X-rays induced by 2 MeV ^{4}He bombardment of 24 samples of different fluorine compounds are presented. Important chemical effects are seen in the spectrum shape. The application of these effects to chemical analysis is demonstrated on samples of fluorine implanted in iron.

59838 **(LARN—812) Concentration depth profiling in fluorine implanted iron.** Deconninck, G.; Bodart, F. (Facultes Universitaires Notre-Dame de la Paix, Namur (Belgium)). [nd]. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702639.

Laminated iron foils have been implanted with 50 keV fluorine ions at different doses between 1 10^{16} ions/cm^2 and 2 10^{17} ions/cm^2. Nuclear resonant reactions are used for the determination of concentration depth profiles. Gamma-rays from the $^{19}F(p,\alpha\gamma)^{16}O^*$ reaction are detected and the advantage of low energy resonances is demonstrated, namely the 340.46 keV resonance has the advantage of high sensitivity and low background making possible large depth investigations (2500 A). Different effects are investigated: surface roughness, total dose, stopping power, thermal diffusion, corrosion, ... Samples are treated at different temperature between 100 and 450°C, the diffusion of fluorine is observed with the 340.46 keV resonance, the sensitivity is good and the background is very low. Above 450°C a rapid oxidation of the surface is observed by nuclear resonant scattering. Depth profile measurements indicate that the oxidation process is responsible for a migration of the fluorine ions.

59839 **(LARN—814) Milliprobe and microprobe analysis of gold items of ancient jewellery.** Demortier, G.; Hackens, T. (Facultes Universitaires Notre-Dame de la Paix, Namur (Belgium)). [nd]. 44p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702640.

It has long been accepted that the presence of cadmium implies a condemnation of the authenticity of an ancient gold object, or at least, of the part of the object where the cadmium is detected. An analysis in Paris of a recently excavated object from Roman times has shown cadmium. Meanwhile, systematic observations were made at L.A.R.N. on objects dating from Hellenistic to Byzantine times with different given origins (objects from a museum and from private collections). By using PIXE with a 3 MeV proton milliprobe (700 μm beam diameter) in a non vacuum geometry, relative amounts of copper, silver, cadmium and gold at the surface of more than 30 gold objects expected to be ancient have been determined. Traces or significant concentrations of cadmium have been detected at several points on or in the neighbourhood of solders on many objects which seem to be from Roman to early Byzantine times. Cadmium concentrations range between 2 to 100 parts per thousand. This range of variations and the relative concentrations of Au, Ag, Cu and Cd at the surface of the objects studied are often different from the figures obtained during analyses of modern soldering alloys. Experiments with the L.A.R.N. proton microprobe (5 μm x 10 μm area) allow a still better topographical resolution and more significative comparison of the relative amounts of the elements of interest in modern soldering alloys and supposedly old solders. The usefulness of the microprobe is demonstrated.

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 59310, 59621, 59819, 59878, 59881, 59900

59840 **(BNL—31739) Small water clusters as theoretical models for structural and kinetic properties of ice.** Newton, M.D. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 21p. (CONF-820865—1). NTIS, PC A02/MF A01. Order Number DE82020765.

From 6. international ice symposium; Rolla, MO, USA (1 Aug 1982).

Ab initio Molecular Orbital (MO) Calculations for water dimers and trimers, using a split-valence basis set supplemented with polarization functions (6-31), including electron correlation for nearest neighbor dimers via second-order Moeller Plesset theory and a dispersion correction for next-nearest neighbor dimers, and with corrections made for basis set superposition errors, have led to a potential energy function for cubic ice which accounts for over half of the compression of the O...O separation relative to that for the free dimer, and which yields a cohesive energy close to the experimental value. A simple model for the activated complex in the migration of Bjerrum L-defects in ice I, based on the concept of a bifurcated OH...O hydrogen bond in conjunction with MO calculations for appropriate water tetramers with a 6-31 basis set, has led to estimates of the activation energy (3.3 and 3.9 kcal/mole) falling in the lower end of the range of previous estimates (2-7 kcal/mole) thus indicating that the activation process requires less than the full bond energy of a single linear hydrogen bond.

59841 **(BNL-NCS—31694) Massive or weighty problem of atomic weight: it's a dimensionless dilemma.** Holden, N.E. (National Nuclear Data Center, Upton, NY (USA)). 1982. Contract AC02-76CH00016. 6p. (CONF-820863—1). NTIS, PC A02/MF A01. Order Number DE82020741.

From 7. ACS biennial conference on chemical education; Stillwater, OK, USA (1 Aug 1982).

This paper attempts to show that: Although mass and force are distinct, there is much ambiguity and often substitution between the words weight and mass. Semantically, the word atomic is at least as misused as weight. There is no rule that atomic weight must have the same dimensions as weight and there are a number of counterexamples in science with the word weight, which would disprove any such rule. If the term is not in error, it becomes merely one of a larger number of terms in science for which we could probably coin better names at this time. The switch from atomic weight to atomic mass would have the student trade one set of confusing problems for a new set of confusing problems. With no compelling reason to change, the weight of tradition should rule the day.

59842 **(CEA-CONF—5984) Iodine-123 production by irradiation at the C.N.R.S. cyclotron in Orleans.** Goin, G.; Vernois, J.; Cimetiere, C.; Leger, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Section d'Exploitation Osiris). Sep 1981. 2p. (CONF-810944—10). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702364.

From 9. international conference on cyclotrons and their applications; Caen, France (7 Sep 1981).

O.R.I.S. -C.E.A. has undertaken a regular production iodine-123 by irradiation at the C.N.R.S. cyclotron in Orleans. The enriched tellurium oxide target is irradiated with protons according to the reaction ^{124}Te (p, 2n) ^{123}I. Iodine-123 is then extracted from the target in the O.R.I.S. laboratories in Saclay. The irradiation device and the dry process extraction of radioiodine are described.

59843 (INIS-SU—86, pp 180) **Inorganic sorbents on the base of phosphates and arsenates of group 5 metals selective to radioisotopes.** Deulin, G.I.; Krylov, V.N.; Desyatnik, V.N.; Larina, K.P.; Pospelov, A.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59844 (MLM—2971) **Aluminum surface-film growth in Al/Fe_3O_4 thermites during accelerated aging.** Wang, P.S.; Haws, L.D. (Mound Facility, Miamisburg, OH (USA)). 10 Aug 1982. Contract AC04-76DP00053. 12p. NTIS, PC A02/MF A01. Order Number DE82021903.

The aluminum and iron oxide surfaces of Al/Fe_3O_4 thermite in powder and pressed pellet form were studied before and after accelerated aging at 180°C by x-ray photoelectron spectroscopy (XPS). The Al_2O_3 surface film thicknesses on Al metal were deduced from the intensity ratio of Al KLL Auger signals induced by x-ray radiation on Al_2O_3 and Al metal. Based on the mean free path of 16.5A for Al KLL Auger electrons, the oxide thickness on aluminum flake before mixing with Fe_3O_4 was estimated to be 8-9 A. A slight oxidation was observed on the aluminum surface after mixing with Fe_3O_4 at room temperature. Hot pressing this mixture at 425°C for 7 min increased the oxide film to 31 A. This surface oxide film seemed to protect the Al metal and further aging at 180°C produced no significant oxide growth. A layer of carboxylate was detected on the aluminum surface from the C ls XPS signal. The presence of an Fe 2p/sub 3/2/ signal indicated the presence of Fe^{+2} and Fe^{+3}. A weak hydroxyl signal was also observed; this was attributed to slight moisture contamination of the Fe_3O_4 surface. 7 figs, 3 tables.

59845 (PB—82-195645) **Heat of mixing apparatus for liquefied gases. Annual report Nov 80-Nov 81.** Streett, W.B.; Zollweg, J.A. (Cornell Univ., Ithaca, NY (USA)). Jan 1982. 10p. NTIS, PC A02/MF A01.

A heat of mixing apparatus for measuring heats of mixing of liquefied gases has been designed and built. It has been tested by measuring the heats of mixing of liquid nitrogen and oxygen at 77.3 K.

59846 (SAND—82-8230) **CHEMSEN: a computer code for sensitivity analysis of elementary chemical-reaction models.** Kramer, M.A.; Kee, R.J.; Rabitz, H. (Sandia National Labs., Livermore, CA (USA); Princeton Univ., NJ (USA)). Aug 1982. Contract AC04-76DP00789. 20p. NTIS, PC A02/MF A01. Order Number DE82020886.

A computer code that computes first-order sensitivity coefficients for constant temperature and pressure chemical kinetics problems is described. These coefficients measure quantitatively the dependence of the species concentrations on the rate constants of the reactions. The sensitivity equations are solved using the new, and highly efficient, Analytically Integrated Magnus method. The code accepts nearly format-free input, and is thus designed to be easy to use.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 59387, 59846, 59851

59847 (UCID—18509-82-1-2) **Development of advanced technologies for photochemical tritium recovery. Bi-quarterly progress report, January 1, 1982-June 30, 1982.** Aldridge, F.T.; Herman, I.P.; Magnotta, F.; Maienschein, J.L.; Marling, J.B.; Young, R.H. (Lawrence Livermore National Lab., CA (USA)). 26 Jul 1982. Contract W-7405-ENG-48. 37p. NTIS, PC A03/MF A01. Order Number DE82021945.

Mixtures of $CTCl_3/CDCl_3$ were successfully detritiated by 12μ laser multiple-photon dissociation. The lower limit of the T/D enrichment factor was determined to be ~ 165. Additional studies concerning the effects of pulse energy, irradiation geometry and sample pressure were conducted. Characterization of both untuned and tuned NH_3 laser configurations were completed. Further laser studies considered implementation of a short pulse CO_2 laser pump source for either the current NH_3 laser or for possible use in a rotational Raman laser. Process engineering requirements for T/D separation at Savannah River were studied in detail and the first complete process design for implementation is presented.

59848 (INIS-mf—7127, pp vp) **Mechanism and kinetics of polymerization of propylene in a microwave plasma.** Carmi, U.; Inspektor, A.; Avni, R. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

4004 Electrochemistry

REFER ALSO TO CITATION(S) 59469, 60516

59849 (DOE/ER/10968—1) **Chemically modified carbon, nickel, and platinum electrodes. Progress report for period 1 September 1981 to 1 August 1982.** (Colorado State Univ., Fort Collins (USA)). 1982. Contract AC02-81ER10968. 10p. NTIS, PC A02/MF A01. Order Number DE82021579.

Two types of complexes which are of interest as potential electrode modifying moieties have been studied fairly extensively in solution, specifically ring-substituted ruthenium trisbipyridine complexes and complexes of the binuclear coordinating ligand nic$_4$TPP. Studies of polyvinyl viologen modified electrodes have been essentially completed and the results reported. Initial work on the preparation of electrode bondable photosensitizer/donor or acceptor has produced one ligand in the series. Finally, we have begun some work with very thick polymer films of Nafion that has produced some interesting and promising results.

4005 Photochemistry

REFER ALSO TO CITATION(S) 59847, 60153, 60205

59850 (CONF-820853—1) **Production and reactions of negative ions.** Compton, R.N. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01. Order Number DE82020824.

From NATO conference on photophysics and photochemistry in the vacuum ultraviolet; Lake Geneva, WI, USA (15 Aug 1982).

Negative ions play a role in photophysics and photochemistry. This review discusses only negative ion properties and reactions in the gas phase. Electron affinities, photoabsorption by negative ions, production of negative ions by photon reactions, and collision of high Rydberg atoms with electron-attaching molecules and the possible influence of dipole bound states are discussed. 59 references. (DLC)

59851 **Quenching and radical formation in the reaction of photoexcited benzophenone with thiols and thioethers (sulfides). Nanosecond flash studies.** Inbar, S.; Linschitz, H.; Cohen, S.G. (Brandeis Univ., Waltham, MA). *Journal of the American Chemical Society;* **104**: No. 6, 1679-1682(1982).

Laser flash measurements have been made of rate constants and primary radical yields in the reactions of triplet benzophenone with aliphatic and aromatic thiols and with dialkyl and aryl alkyl sulfides. Reaction with n-pentylthiol in benzene leads mainly to quenching, with k/sub ir/ = 9 x 10^6 M^{-1} s^{-1} and radical yield (ketyl) = 0.14; with mesitylene-2 thiol in benzene k/sub ir/ = 7 x 10^8 M^{-1} s^{-1} and hydrogen transfer is efficient, radical yield (ketyl) ~ 1.0. In reactions with both p-chlorophenyl ethyl and diisopropyl sulfides, k/sub ir/ increases and radical yield (ketyl) decreases with increasing solvent polarity. Values of k/sub ir/ are higher and those of radical yield (ketyl) are lower for the dialkyl than for the aryl alkyl sulfide. Results are discussed in terms of rapid interaction of the triplet with S, followed by quenching and/or hydrogen transfer. Quenching without hydrogen transfer occurs to a much greater extent with sulfides and aliphatic thiols than with amines.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 59499, 59837

59852 (BNL—31664) Recent studies on radiation induced F-center and colloid particle formation in synthetic NaCl and natural rock salt. Levy, P.W.; Loman, J.M.; Swyler, K.J.; Dougherty, D.R. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 12p. (CONF-820864—2). NTIS, PC A02/MF A01. Order Number DE82020743.

From 4. europhysical topical conference on lattice defects in ionic crystals; Dublin, Ireland (30 Aug 1982).

Radiation induced F-center and Na metal colloid formation have been studied, at temperatures between 100 and 350°C, in melt growth synthetic NaCl crystals and natural rock salt samples, using equipment for making optical measurements during 1 to 3 MeV electron irradiation. In both types of NaCl the damage formation kinetics are qualitatively similar. However, there are large quantitative differences which depend on irradiation temperature, dose rate, total dose, inherent strain, strain applied prior to irradiation and other factors. Natural rock salt samples from different localities exhibit markedly different radiation induced colloid formation rates. An extrapolation of the current data to the doses expected in radioactive waste depositories indicate that natural salt immediately adjacent to the planned waste canisters could develop between 0.1 and 50% colloidal sodium in 40 to 1000 years. 3 figures.

59853 (INIS-SU—86, pp 153) Stability of valence states of neptunium, plutonium, americium and berkelium ions in solutions with intensive internal alpha- and beta-irradiation. Andrejchuk, N.N.; Vityutnev, V.M.; Erin, E.A.; Frolov, A.A.; Frolova, L.M.; Chistyakov, V.M.; Vasil'ev, V.Ya. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59854 (INIS-SU—86, pp 194) Nuclear chemistry of tritium in inorganic lithium materials. Vasil'ev, V.G.; Ershova, Z.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59855 (INIS-SU—86, pp 14) Non-thermal methods to activate solid-state chemical reactions. Boldyrev, V.V.; Lyakhov, N.Z. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59856 (INIS-SU—86, pp 220-221) Radiation modification of catalytic properties of contacts in the hydrogenation reaction. Kuzembaev, K.K.; Sokol'skij, D.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59857 (INIS-SU—86, pp 222) Radiolysis of carbon dioxide in the presence of inorganic and organic additions. Kurbanov, M.A.; Rustamov, V.R.; Kerimov, V.K.; Musaeva, P.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59858 (LBL—14315) Reaction mechanisms in the radiolysis of peptides, polypeptides, and proteins. I. Reactions of the peptide main-chain in model systems. Garrison, W.M. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 32p. NTIS, PC A03/MF A01. Order Number DE82020573.

The object of this review is to bring together and to correlate our present knowledge of products and mechanisms in the radiolysis of peptides, polypeptides and proteins in both aqueous and solid-state systems. Results obtained with various experimental techniques such as product analysis, competition kinetics, ESR spectroscopy and pulse radiolysis are included. Here in part I the emphasis is on the various radiation-induced reactions of the peptide main-chain in model systems. In part II the emphasis is on the radiation chemistry of side-chain loci of the aliphatic, sulfur-containing, aromatic and other unsaturated amino acid residues in similar systems. And, in part III this information on model systems is used in interpreting the mechanisms of chemical change in the radiolysis of proteins in aqueous solution and in the solid state. 60 references.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 59263, 59264, 59297, 59300, 59305, 59804, 59805, 59816, 59817, 59819, 59854, 60027

59859 (BNL—31713) Short-lived positron emitter labeled radiotracers - present status. Fowler, J.S.; Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 10p. (CONF-820666—7). NTIS, PC A02/MF A01. Order Number DE82020526.

From International symposium on the synthesis and applications of isotopically labeled compounds; Kansas City, MO, USA (6 Jun 1982).

The preparation of labelled compounds is important for the application of positron emission transaxial tomography (PETT) in biomedical sciences. This paper describes problems and progress in the synthesis of short-lived positron emitter (^{11}C, ^{18}F, ^{13}N) labelled tracers for PETT. Synthesis of labelled sugars, amino acids, and neurotransmitter receptors (pimozide and spiroperidol tagged with ^{11}C) is discussed in particular. (DLC)

59860 (INIS-mf—6967, pp vp) Quality control of radioisotopic products. Van Wyk, A.J. (Atomic Energy Board, Pelindaba, Pretoria (South Africa). Isotope Production Centre). 1981. Dep. NTIS (US Sales Only).

From Symposium on isotope production and applications; Pretoria, South Africa (12 Mar 1981).

Radiopharmaceutical quality control is a very comprehensive and responsible activity since it concerns products being used for the health care of patients. Quality control is practised by an analytical specialist in close cooperation with pharmacists who are responsible for routine quality assurance. The scope of quality control is comprehensive, e.g. physical inspection and chemical control of all inactive starting material including supervision of the various stages of production. The quality control of radioactive material includes nuclidic analysis, verification of radiochemical purity as well as regular stability checks. Biological controls comprise sterility tests both on final products and production environment; testing for toxicity, pyrogens and LD_{50} values. To test product efficacy it is imperative to rely on biodistribution. Rabbits are used for quality control screening in a qualitative static mode and the dissection of mice organs is carried out for time-consuming quantitative analyses. Since radiopharmaceuticals are being used in a dynamic mode by nuclear medicine, their quality control tests on animals should, for proper evaluation, be carried out by means of comparative studies with imported products and by using a high-resolution camera with computer facilities.

59861 (INIS-mf—6967, pp vp) Facilities for the production of radioisotopes at Pelindaba. Smith, M.E. (Atomic Energy Board, Pelindaba, Pretoria (South Africa). Isotope Production Centre). 1981. Dep. NTIS (US Sales Only).

From Symposium on isotope production and applications; Pretoria, South Africa (12 Mar 1981).

From humble beginnings in 1967 the Isotope Production Group has reached the stage where a hot cell complex is being commissioned. The intervening years have taught us many things, most of which have been incorporated into the design of this building. One of the main design criteria has been the adoption of the French Hot-Cell System which eliminates the problems of contamination and radiation by using a removable air-tight glove box within the lead biological shield. Unfortunately the system has a number of drawbacks, mainly being the limitations of the small working volume and the time taken to effect inter-cell transfer. The former problem has been solved by the miniaturisation of in-cell components; the latter problem has been accepted as unsolvable be-

cause its solution is tied to the lowering of safety standards. The French System places strong emphasis on the integrity of the glove box and the supporting ventilation system which keeps the box at below atmospheric pressure. This policy has been applied throughout the building, with areas of different contamination potential being supplied with separate ventilation systems.rtain circumstances affect the adjacent system. The interlocks, differential pressure controllers and safety cut-outs were a great fraction of the totalbuilding costs.

59862 (INIS-mf—6967, pp vp) **Role of the chemist in the development and production of radioisotope preparations.** Fourie, P.J. (Atomic Energy Board, Pelindaba, Pretoria (South Africa). Isotope Production Centre). 1981. Dep. NTIS (US Sales Only).

From Symposium on isotope production and applications; Pretoria, South Africa (12 Mar 1981).

The Isotope Production Centre manufactures and markets radioisotopes for use in medical, industrial and research field. Sealed radiation sources such as cobalt-60 and iridium-192 are applied widely in the industrial field in, for example, density measurements, radiation sterilisation of medical equipment, and gamma radiography of structures. For industrial tracer and research purposes sodium-24, argon-41, bromine-82, iodine-131 and gold-198 are regularly used in simple chemical form. There are some thousands of radioisotope-labelled compounds of which the largest group comprises compounds of tritium, carbon-14 and sulphur-35. Because the last-mentioned isotopes have long physical half-lives and poor detectability in in-vivo systems, they are used in vitro mainly in biomedical research. Radioisotopes such as iodine-131, iodine-123, indium-111, technetium-99m, krypton-81m and gallium-67 are in great demand for in vivo medical examinations because of their suitably short half-lives and detectability by the gamma camera. Iodine-125, usually manufactured in a nuclear reactor, plays a very important role in radioimmuoassays(RIA). The latter technique is an unusually sensitive, spesific in vitro analytical method which enables scientists to determine nanogram to picogram amounts of chemical compounds in blood..

59863 (INIS-SU—86, pp 154) **Preparation and investigation of hydroxo-salts of plutonium(4) and thorium with single-base inorganic and carboxylic acids.** Shmidt, V.S.; Andryushin, V.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59864 (INIS-SU—86, pp 154-155) **Experimental study of valence zone of electron shells of actinide element ions.** Baev, A.S.; Kulakov, V.M.; Teterin, Yu.A.; Gorshkov, N.G.; Mashirov, L.G.; Suglobov, D.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59865 (INIS-SU—86, pp 155) **Possibilities of electron-vibration spectra in studying of structure of uranyl coordination compounds.** Krasilov, Yu.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59866 (INIS-SU—86, pp 156) **Stereochemistry of simple and complex compounds of hexavalent uranium.** Mikhajlov, Yu.N.; Kanishcheva, A.S.; Ivanov, S.B. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59867 (INIS-SU—86, pp 157) **Bridge polimerization of uranyl coordination compounds.** Shchelokov, R.N.; Orlova, I.M.; Podnebesnova, G.V.; Sergeev, A.V.; Bejrakhov, A.G.; Mikhajlov, Yu.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59868 (INIS-SU—86, pp 157-158) **Preparation of uranocenes and investigation of their properties.** Devyatykh, G.G.; Solov'ev, V.P.; Sevast'yanov, V.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59869 (INIS-SU—86, pp 158-159) **Synthesis and thermolysis of uranium carboxylates.** Dunaeva, K.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59870 (INIS-SU—86, pp 159-161) **Complexing of actinides in melts.** Barbanel, Yu.A.; Klokman, V.P.; Kotlin, V.P.; Kolin, V.V.; Gavrish, Yu.I.; Smirnov, A.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59871 (INIS-SU—86, pp 161-162) **Complexing of uranyl with phosphoric acids.** Goeva, L.V.; Dyatlova, N.M.; Kuznetsov, N.T.; Torsunova, N.I.; Frangulyan, G.D.; Tsapkin, V.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59872 (INIS-SU—86, pp 162) **Closo - borate compounds of uranyl.** Zemskova, L.A.; Kuznetsov, N.T.; Ippolitov, E.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59873 (INIS-SU—86, pp 164) **Low-temperature matrix synthesis of uranium trifluorophosphine complex.** Klimov, V.D.; Kushlyanskij, O.A.; Legasov, V.A.; Lebedev, A.V.; Nastyukha, A.N.; Petrov, V.M.; Khoroshev, S.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59874 (INIS-SU—86, pp 165) **Interaction of thorium aqua-tetraacido-compounds with NO.** Molodkin, A.K.; Ivanova, O.M.; Goeva, L.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59875 (INIS-SU—86, pp 166) **Preparation of higher fluorides and oxides of radon.** Avrorin, V.V.; Krasikova, R.N.; Nefedov, V.D.; Toropova, M.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59876 (INIS-SU—86, pp 167) **Synthesis of oxygen-containing aliphatic carbon-labelled derivatives in silent-discharge plasma on the base of carbon-14 oxides and methane.** Eremeev, A.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59877 (INIS-SU—86, pp 168) **Diphthalocyanine and dipivaloylmethanate complexes of actinides.** Mis'ko, Yu.S.; Mishin, V.Ya.; Moskalev, P.N.; Rubtsov, E.N.; Shapkin, G.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59878 (INIS-SU—86, pp 170) **Mixed selenides of uranium and rare earths of the $Ln_2U_2Se_7$, $Ln_4U_5Se_{16}$, Lnsub(0,5)Usub(0,5)Se_2 compositions.** Slovyanskikh, V.K.; Kuznetsov, N.T.; Gracheva, N.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59879 (INIS-SU—86, pp 171) **Peculiarities of polymeric coordination of ligands in uranyl complexes.** Skutov, I.K.; Popov, V.G.; Nikanovich, M.V.; Atrashevskij, Yu.I.; Kovrikov, A.B.; Novitskij, G.G.; Umrejko, D.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59880 (INIS-SU—86, pp 172) **Phase ratios in the curium - oxygen system.** Sudakov, L.V.; Baranov, A.Yu.; Lyalyushkin, N.V.; Shimbarev, E.V.; Kapshukov, I.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59881 (INIS-SU—86, pp 173) **Study into interaction between iron oxides and uranium dioxide by the method of nuclear gamma resonance spectroscopy.** Timachev, M.A.; Tolmachev, Yu.M.; Cherezov, N.K.; Bogdanov, P.B. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59882 (INIS-SU—86, pp 173-174) **Magnetochemistry of uranium (4) coordination compounds.** Rotov, A.V.; Bolotova, G.T.; Larin, G.M.; Shchelokov, R.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59883 (INIS-SU—86, pp 174-176) **Organic phosphorus polymeric sorbents for processes of actinide extraction.** Laskorin, B.N.; Lejkin, Yu.A.; Filippov, E.A.; Il'inskij, A.A.; Bavrin, B.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59884 (INIS-SU—86, pp 190) **Investigation of radioruthenium-103 by certain metal hydroxides.** Kochetkov, V.L.; Plotnikov, V.I.; Taurbaeva, T.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59885 (INIS-SU—86, pp 200-201) **Observation of the Moessbauer effect on sup(119m)Sn recoil nuclei in metallic cadmium.** Bogdanov, R.V.; Cherezov, N.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59886 (INIS-SU—86, pp 202-203) **Preparation and separation of certain radioisotopes of high specific activity.** Khabibulaev, P.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59887 (INIS-SU—86, pp 203-204) **Use of atomic tritium for preparation of labelled biologically active compounds and investigation of their structure.** Nesmeyanov, A.N.; Filatov, E.S.; Simonov, E.F.; Gol'danskij, V.I.; Shishkov, A.V.; Gedrovich, A.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59888 (INIS-SU—86, pp 204-205) **Preparation of tritium-labelled biologically active compounds.** Shevchenko, V.P.; Myasoedova, N.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59889 (INIS-SU—86, pp 205-206) **Ligand-exchange chromatography in purification and separation of racemates of tritium-labelled amino acids.** Zolotarev, Yu.A.; Penkina, V.I.; Petrenik, O.V.; Myasoedov, N.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59890 (INIS-SU—86, pp 206-207) **Ways of synthesis and use of labelled ethylene imides of phosphoric and thiophosphoric acids in pharmacokinetic investigations.** Savin, Yu.I.; Korolev, G.K.; Chernov, V.A.; Safonov, T.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59891 (INIS-SU—86, pp 207) **Ways of synthesis and metabolism of derivatives of pyrimido- (4,5-6)(1,4)-thiazine labelled with tritium (^{3}H) and carbon (^{14}C).** Yadrovskaya, V.A.; Nemeryuk, M.P.; Korolev, G.K.; Linberg, L.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59892 (INIS-SU—86, pp 208) **Study of complexing in solutions and development of diagnostic radiopharmaceuticals.** Levin, V.I.; Kodina, G.E.; Kozlova, M.D.; Gracheva, M.A.; Golutvina, M.M.; Tronova, I.N.; Starovojtova, L.P.; Medvedeva, E.I.; Sevast'yanova, A.S.; Sedov, V.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59893 (INIS-SU—86, pp 211) **Reactions of iodine-131 with tetracycline in methanol and acetone.** Mironov, V.P.; Kudryashov, V.P.; Grushevich, L.E. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59894 (INIS-SU—86, pp 212) **Chemical forms of stabilization of phosphorus-32, sulfur-35 and chlorine-38 in the simplest carbon chlorides.** Mironov, V.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

59895 (JINR-R—12-81-509) **Determination of carbon-astatine chemical bond energy.** Vasharosh, L.; Norseev, Yu.V.; Khalkin, V.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702641.

The energy of chemical bond Carbon-Astatine (Dsub(C-At)) in aromatic and alyphatic compounds of astatine was determined by pyrolytic method. The following values were obtained for Dsub(C-At):44.9+-5.1 Kcal/mol in astatobenzene (at experimental temperature 642-725 K); 38.6+-2.5 Kcal/mol in n-astatopropyl (at 608-627 K), 36.3+-2.3 Kcal/mol in iso-astatopropyl (at 524-577 K).

59896 (K/AIS—5003) **Index-of-refraction measurement of uranium hexafluoride vapor at 632.8 and 457.9 nanometers.** Wright, S.P. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 16 Aug 1982. Contract W-7405-ENG-26. 40p. NTIS, PC A03/MF A01. Order Number DE82020692.

The index of refraction of uranium hexafluoride (UF_6) vapor was measured at 632.8 nanometers and 457.9 nanometers using a Michelson interferometer. The refractive index was determined from the fringe shifts of the interference pattern as the UF_6 gas was fed into the evacuated test cell of the interferometer. Measurements were made at room temperature and at pressures ranging from 0 to

90 torr. At a confidence level of 90%, the resulting equations for the index of refraction of UF_6 vapor at the two colors are: (n - 1) = (5.268 +- 0.010) x 10^{-4} P(torr)/T(K) at 632.8 nm; and (n - 1) = (5.414 +- 0.014) x 10^{-4} P(torr)/T(K) at 457.9 nm. A nonideality correction factor has been reported for UF_6. For the temperature and pressure range covered in this experiment, the correction factor was negligible; but for extrapolation of the data to higher pressures and temperatures, the correction factor should be included. The resulting equations are: (n - 1) = (5.233 +- 0.010) x 10^{-4} P(1 + AP)/T(K) at 632.8 nm; and (n - 1) = (5.381 +- 0.014) x 10^{-4} P(1 + AP)/T(K) at 457.9 nm, where A($torr^{-1}$) = 1622.1/T^3(K).

59897 (SSA—1981-TS-2, pp 409-413) **Radioactive labelling of superoxide dismutases.** Baret, A.; Courtiere, A.; Theretz, A.; Schiavi, P. (Hopital d'Instruction des Armees Sainte-Anne, 83 - Toulon-Naval (France). Centre d'Etudes et de Recherches Biophysiques Appliquees a la Marine). Aug 1981. (In French). NTIS (US Sales Only), PC A99/MF A01.

In 1980 Scientific works.

59898 (SSA—1981-TS-2, pp 440) **Labelling of RNA 3' (OH) terminal with tritiated borohydrides.** Savelli, D.; Nicoli, J. (Centre d'Etudes et de Recherches de Medecine Tropicale (C.E.R.M.T.), 33 - Bordeaux (France)). Aug 1981. (In French). NTIS (US Sales Only), PC A99/MF A01.

In 1980 Scientific works.

59899 **Fission product transmutation effects on high-level radioactive waste forms.** Gray, W.J. (Pacific Northwest Lab., Richland, WA (USA)). *Nature (London);* **296**: No. 5857, 547-549(8 Apr 1982).

The problem of self-radiation of high-level radioactive waste by the transmutation of fission products caused by their β-decay is being studied by using ^{134}Cs in waste forms and other solids to simulate the behaviour of the long-lived ^{137}Cs and ^{90}Sr isotopes. In this preliminary report, after 2 yr of decay, the results indicate negligible changes in the properties of the materials studied.

59900 **Thermodynamic properties of Na_2UO_4, $Na_2U_2O_7$, and $NaUO_3$.** Cordfunke, E.H.P.; Muis, R.P.; Ouweltjes, W. (Netherlands Energy Research Foundation, Petten); Flotow, H.E.; O'Hare, P.A.G. (Argonne National Lab., IL (USA)). *Journal of Chemical Thermodynamics;* **14**: No. 4, 313-322(Apr 1982).

The low-temperature (5 to 350 K) heat capacity of α-$Na_2U_2O_7$ has been determined by adiabatic calorimetry. These measurements have yielded the following thermodynamic functions at T = 298.15 K: C°sub(p)(T); S°(T); (H°(T)-H°(0)); (G°(T)-H°)/T. Values are given. The enthalpy increments of α-$Na_2U_2O_7$ (390 to 558 K), and β-$Na_2U_2O_7$ (680 to 926 K), have been measured by drop calorimetry. The enthalpies of solution of α-Na_2UO_4 and α-$Na_2U_2O_7$ in 1.505 mol.dm^{-3} H_2SO_4 solution have been measured calorimetrically. In combination with the enthalpies of solution of γ-UO_3(s) and Na_2SO_4(s) in this solvent, the standard enthalpies of formation of α-Na_2UO_4 and α-$Na_2U_2O_7$ have been derived. The results are reported for ΔH°sub(f) (s, 298.15 K)/(kJ.mol^{-1}): α-Na_2UO_4; and α-$Na_2U_2O_7$. The thermodynamic functions of Na_2UO_4 and $Na_2U_2O_7$ have been computed. In addition, enthalpy increments of $NaUO_3$ have been measured from 415 to 931 K and these results have been combined with published values to evaluate the thermodynamic functions of $NaUO_3$.

59901 **Thermochemistry of uranium compounds. 12. Standard enthalpies of formation of the α and β modifications of uranium pentafluoride. The enthalpy of the β-to-α transition at 298.15 K.** O'Hare, P.A.G.; Malm, J.G. (Argonne National Lab., IL (USA)); Eller, P.G. (Los Alamos National Lab., NM (USA)). *Journal of Chemical Thermodynamics;* **14**: No. 4, 323-330(Apr 1982).

From 6. international conference on thermodynamics; Merseburg, German Democratic Republic (Aug 1980).

A solution-calorimetric determination of the enthalpies of reaction of the α and β modifications of UF_5 with $Ce(SO_4)_2$ + H_2SO_4 is described. Auxiliary measurements were made of the enthalpies of reaction of UO_2, γ-UO_3, and HF(aq). From these results are calculated the standard enthalpies of formation ΔH°sub(f)(298.15 K) of β-UF_5 and of α-UF_5. The enthalpy of the (β-to-α) transition is (7.5 +- 2.1) kJ.mol^{-1} at 298.15 K. Suggested ΔH°sub(f) values are also given for U_4F_{17} and U_2F_9.

59902 **Thermochemistry of uranium compounds. 13. Standard enthalpies of formation at 298.15 K of α-uranium oxide tetrafluoride (UOF_4) and uranyl fluoride (UO_2F_2). Thermodynamics of (uranium + oxygen + fluorine).** O'Hare, P.A.G.; Malm, J.G. (Argonne National Lab., IL (USA)). *Journal of Chemical Thermodynamics;* **14**: No. 4, 331-336(Apr 1982).

A solution-calorimetric study has yielded standard enthalpies of formation for the following:ΔH°sub(f)(UOF_4, c, α, 298.15 K) and ΔH°sub(f)(UO_2F_2, c, 298.15 K). The following quantities (at 298.15 K) have been estimated: S°(UOF_4, c, α); ΔH°sub(f)($U_2O_3F_6$, c); S°(U_2O_3F6, c) and ΔH°sub(f)($U_3O_5F_8$, c). The thermodynamics of the following reactions have been analyzed: $2UOF_4(c) = UO_2F_2(c) + UF_6(g)$; $3UOF_4(c) = U_2O_3F_6(c) + UF_6(g)$; $U_3O_5F_8(c) = 5/2\ UO_2F_2(c) + 1/2\ UF_6(g)$.

59903 **Thermodynamics of actinide perovskite-type oxides. 1. Enthalpy of formation of Ba_2MgUO_6 and Ba_2MgNpO_6.** Morss, L.R. (Rutgers--the State Univ., New Brunswick, NJ (USA). School of Chemistry; Argonne National Lab., IL (USA)); Fuger, J. (Liege Univ. (Belgium). Lab. of Analytical Chemistry and Radiochemistry); Jenkins, H.D.B. (Warwick Univ., Coventry (UK). Dept. of Chemistry and Molecular Sciences). *Journal of Chemical Thermodynamics;* **14**: No. 4, 377-384(Apr 1982).

The ordered perovskite Ba_2MgNpO_6 has been synthesized and is isomorphous with the corresponding uranium compound Ba_2MgUO_6. The compounds are face-centered cubic, and space group Fm3m. Lattice constants are given. The enthalpies of formation were determined and are given. The stabilities of these complex oxides with respect to aqueous solutions and with respect to the parent binary oxides are discussed. The enthalpy of formation of (unstable) NpO_3(c) has been estimated.

59904 **(INIS-mf—7117) Status report 1980 of the scientific sector 'Nuclear Chemistry' promoted by the BMFT (Federal Ministry for Research and Technology).** (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). [nd]. 282p. (In German). NTIS (US Sales Only), PC A13/MF A01. Order Number DE82780633.

Individual items, in scope for the data base, were processed separately. (DLC)

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 59962

59905 **(AD-A—112597/0) Combustion of alternate fuel systems shock tube studies of the decomposition of organic molecules. Final report.** (Geo-Centers, Inc., Newton Upper Falls, MA (USA)). Feb 1982. 17p. (GC-TR—82-165). NTIS, PC A02/MF A01.

This report summarizes a series of shock tube experiments. During this time period, a CO laser was calibrated for the purpose of monitoring CO formation rates during the decomposition of several organic molecules. The compounds investigated were formic acid (HCOOH), formaldehyde (HCHO), ketene (CH_2CO), and cyclobutanone (C_4H_6O). The decomposition data are under analysis.

59906 **(DOE/ER/10970—1) Ionic aspects of soot formation.** Koski, W.S. (Johns Hopkins Univ., Baltimore, MD (USA). Dept. of Chemistry). Aug 1982. Contract AC02-81ER10970. 8p. NTIS, PC A02/MF A01. Order Number DE82020799.

Studies of hydrocarbon flames indicate that ions play an important role in the process of soot formation. Scientists who have studied the ionic aspects of soot formation have proposed complex

schemes involving many ion-molecule reactions. However, since most of the candidate ion-molecule reactions have not been studied a sound interpretation of much of the combustion data involving ion-molecule reactions is not possible. The objective of this program is to study as many of the ion-molecule reactions as possible and correlate these results with reported combustion results. In this report reactions of the following are discussed; reactions of H_3O^+ with benzene; reactions of D_3O^+ with naphthalene; reactions of CHO^+ with benzene; reactions of $C_3H_3^+$ with acetylene. Ion beam techniques and tandem mass spectrometers were used in this study. Charge transfer and proton transfer reactions involving aromatic products were also investigated. (ATT)

42 ENGINEERING

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 59164, 59166, 59273, 59277, 59474, 60072, 60163, 60290, 60596

59907 **(NP-tr—2904690) Regulating valve for a flowing-liquid medium.** Efankin, G.A. (British Gas Corp., London). [nd]. Translation of Russian Patent No. 679434/25. 3p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82904690.

Portions of document are illegible.

A regulating valve for flowing liquid medium is disclosed employing as closure member a cylinder with side ports, located in a housing and linked with a pneumatic regulator mechanism, characterized in that, for the purpose of reducing resistance to the flowing medium at high throughput rates, the cylinder with side ports is provided with an internal conical deflector and is located on the flow axis in front of a blank wall of the housing, through which is led a shaft connecting the cylinder with the pneumatic regulator mechanism by means of a crank and connecting rod mechanism.

59908 **(BDX—613-2818) Analysis of electrochemical deburring. Final report.** Gillespie, L.K.; Moore, W.M. (Bendix Corp., Kansas City, MO (USA)). Sep 1982. Contract AC04-76DP00613. 154p. NTIS, PC A08/MF A01. Order Number DE82020881.

Electrochemical deburring (ECD) is being used successfully to finish precision miniature parts. Process success requires consistent burr size, relatively precision tools, and careful choice of parameters. The product voltage x time is the principle variable in determining amount of material removed from edges. Burr volume as opposed to burr height or burr thickness is the most significant burr variable. Twelve process side effects are noted. The side effects generally are controllable or of little concern on many parts. Economics, tool design, and machining aspects of ECD are discussed.

59909 **(CEA-CONF—6060) Validation of the Apollo-Moret neutronic codes on critical experimental configurations simulating the shipping casks for light water fuels.** Haon, D.; Manaranche, J.C.; Mangin, D.; Maubert, L.; Poullot, G. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Surete Nucleaire). Nov 1980. 9p. (CONF-801115—46). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702375.

From 6. international symposium on packaging and transporting radioactive material; Berlin, F.R. Germany (10 Nov 1980).

The presented experimental data provide benchmarks. The practical lessons drawn from the experiments and the good agreement of calculation results (Apollo and Moret codes) with experimental determinations give us confidence in achieving nuclear criticality safety studies of shipping casks for light water reactors fuel elements.

59910 **(CEA-CONF—6074) Partial automation of an electron beam welding linear machine.** Dillet, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Div. de Metallurgie et d'Etude des Combustibles Nucleaires). Oct 1981. 15p. (In French). (CONF-8110185—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702373.

From AFCET automation congress; Nantes, France (27 Oct 1981).

After recalling electron beam welding principle and operation, realization, adjustment and tests are described.

59911 **(ECN—109) Design of the SULTAN inner coil.** Franken, W.M.P.; Spoorenberg, C.J.G. (Netherlands Energy Research Foundation, Petten). Dec 1981. 119p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82702372.

The background field of the first phase of the test facility SULTAN will be generated by two concentric solenoids: a 6 Tesla outer coil with a free bore of 1.3 m and an inner coil for increasing the field to 8 Tesla. The free bore (cold) will be 1.055 m. The final design of the 8 Tesla inner coil is described. The coil will operate at an overall current density of 23×10^6 A/m^2. It will be cooled directly by forced flow supercritical helium. A hollow conductor is applied, composed of a rectangular copper tube and a 16 strands Rutherford cable, soldered on one side of the tube. The copper tube will be cold worked to cope with the high stress level (165 MPa). The design base (field and stress analysis, cooling, stability), the mechanical design and the instrumentation will be specified. The design and construction of the coil is a part of the collaboration between ECN and Holec Transformer Group.

59912 (INIS-mf—6937, pp vp) **Meteorological data and models for selection and design of cooling towers in the Negev.** Velner, S.; Schaal, M. (Israel Electric Corp. Ltd., Haifa). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beer-shaba, Israel (4 Dec 1980).

59913 **(JINR—8-81-254) Ambiguity of hydrodynamic characteristics of the vapor generating channels of cryogenic objects.** Ageev, A.I.; Burinov, V.F.; Zinchenko, S.I.; Filippov, Yu.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1981. 60p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82702371.

The dependence of inlet and outlet hydraulic resistance of vapor generating channel with local resistances on the flow mass is analysed in the case when the flow is supplied as a subcooled- up-to-saturation liquid. Analytical expressions are obtained in a dimensionless form for conditions of instability of hydrodynamic characteristics of the object considered. The calculation results of Jacob numbers for widespread cryoagents-helium, hydrogen, nitrogen and, for comparison, for water - are presented. These results indicate that when creating cryogenic objects a possibility of hydrodynamic characteristics should be taken into account.

59914 **(NUREG/CR—2709) Critical experiments with 4.31 wt % ^{235}U-enriched UO_2 rods in highly borated water lattices.** Durst, B.M.; Bierman, S.R.; Clayton, E.D. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 20p. (PNL—4267). GPO $3.50.

A series of critical experiments were performed with 4.31 wt % ^{235}U enriched UO_2 fuel rods immersed in water containing various concentrations of boron ranging up to 2.55 g/l. The boron was added in the form of boric acid (H_3BO_3). Critical experimental data were obtained for two different lattice pitches wherein the water-to-uranium oxide volume ratios were 1.59 and 1.09. The experiments provide benchmarks on heavily borated systems for use in validating calculational techniques employed in analyzing fuel shipping casks and spent fuel storage systems that may utilize boron for criticality control.

59915 **(RFP—3279) Automatic temperature-calibration system.** Thompson, R.L.; Stant, R.S. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 23 Aug 1982. Contract AC04-76DP03533. 44p. NTIS, PC A03/MF A01. Order Number DE82021953.

A relatively inexpensive, computer-controlled temperature calibration system is described. The system will provide working standard level calibration between -90°C and +1100°C for multiple resistance thermometers or thermocouples. It is designed to collect

the data in a cooldown or ballistic state using either a platinum resistance thermometer (PRT) or a precision thermocouple as a standard. The use of this calibration system increases measurement repeatability, while greatly reducing the man-hours required for a calibration. Construction and basic software details of the temperature calibration system are provided.

59916 **(SAND—81-2055) Conceptual design of the Clinch River Breeder Reactor spent-fuel shipping cask.** Pope, R.B.; Diggs, J.M. (eds.). (Sandia National Labs., Albuquerque, NM (USA)). Apr 1982. Contract AC04-76DP00789. 111p. NTIS, PC A06/MF A01. Order Number DE82020049.

Details of a baseline conceptual design of a spent fuel shipping cask for the Clinch River Breeder Reactor (CRBR) are presented including an assessment of shielding, structural, thermal, fabrication and cask/plant interfacing problems. A basis for continued cask development and for new technological development is established. Alternates to the baseline design are briefly presented. Estimates of development schedules, cask utilization and cost schedules, and of personnel dose commitments during CRBR in-plant handling of the cask are also presented.

59917 **(SAND—82-0711C) Development flight-test results and performance capabilities for the Malemute II rocket motor.** Millard, W.A.; Barton, W.R.; Hoekstra, P.W. (Sandia National Labs., Albuquerque, NM (USA); Thiokol Chemical Corp., Brigham City, UT (USA). Wasatch Div.). 1982. Contract AC04-76DP00789. 11p. (CONF-821017—2). NTIS, PC A02/MF A01. Order Number DE82018749.

From 6. AIAA sounding rocket conference; Orlando, FL, USA (26 Oct 1982).

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A discussion of the problems encountered with the Malemute I rocket that led to the development of the Malemute II is presented in this paper. The rationale for formulation of a new propellant and redesign of the insulation system for the Malemute II is presented. Static and flight test results are included in the paper, and show good agreement with pretest calculations. Most significantly, the flight test program demonstrated the Malemute II can be successfully flown in a regime where failure had occurred with the Malemute I.

59918 **(SAND—82-0970C) Development testing of a cornering water-jet drill.** Shirey, D.L.; Love, S.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 18p. (CONF-820840—9). NTIS, PC A02/MF A01. Order Number DE82020354.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

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A drilling system is being developed which uses high pressure water jets to drill horizontal holes in a coal seam accessed through a vertical borehole. For underground coal gasification, these horizontal holes create linking paths between vertical process wells. Currently, the full-scale cornering drill system is undergoing above-ground evaluation tests in Albuquerque. An elevated test platform is being used to permit observation of the cornering and drilling mechanisms during operation. A simulated coal block serves as a convenient drilling target during these tests. Recorded hole location data have been compared with independently determined measurements. Test results to date indicate satisfactory performance of the major drill components. 10 figs.

59919 **(SAND—82-0971C) Instrumentation for the cornering water-jet drill.** Engler, B.P. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 22p. (CONF-820840—12). NTIS, PC A02/MF A01. Order Number DE82020357.

From 8. underground coal conversion symposium; Keystone, CO, USA (15 Aug 1982).

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A cornering drilling system is being developed which utilizes rotating high-pressure water jets to drill horizontal holes from a vertical borehole. Aboveground tests of the full-scale system are underway. A key feature of the system is the ability to monitor the performance of the drilling equipment and the location of the drill string underground at all times. To do this, the drill utilizes onboard directional transducers, a computerized data acquisition and processing subsystem, and a driller's control station. The instrumentation system has worked satisfactorily in the two holes drilled at the Sandia National Laboratories testing facility. This report summarizes the design and evaluation of that instrumentation system to date. 10 figures.

59920 **(SAND—82-1631C) Random vibration control system for testing a single test item with multiple inputs.** Smallwood, D.O. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 7p. (CONF-821019—1). NTIS, PC A02/MF A01. Order Number DE82018973.

From SAE aerospace meeting; Anaheim, CA, USA (25 Oct 1982).

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This paper describes a multiple shaker control system developed at Sandia National Laboratories for driving a single test item with random excitation. The system allows for cross-coupled mechanical systems with partially coherent control points. The system uses time-domian randomization to generate the continuous Gassian drive signals.

59921 **(SAND—82-8016) Floppy-disk system for punched-tape reader emulation.** Hopwood, J.E. (Sandia National Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 46p. NTIS, PC A03/MF A01. Order Number DE82021126.

This report describes the application of minifloppy disk systems to numerically-controlled machine tools at Sandia, Livermore, as an alternative to time-consuming and unreliable punched-tape readers.

59922 **(SAND—82-8020) Initiation of GTAW ARCS by high-voltage impulses.** Hopwood, J.E. (Sandia National Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 12p. NTIS, PC A02/MF A01. Order Number DE82021707.

An impulse arc starter for generating a sustained plasma flow for gas tungsten arc gas welding has been developed. This method overcomes the disadvantages inherent in other methods of arc starting.

59923 **(UCID—19436) High-pressure computerized gas-metering manual for System I at Building 343.** Koide, G.; Radewan, C.; Blaedel, K.; Cervelli, J. (Lawrence Livermore National Lab., CA (USA)). 19 Jul 1982. Contract W-7405-ENG-48. 84p. NTIS, PC A05/MF A01. Order Number DE82020345.

The computerized gas metering system is a high-pressure (up to 16,000 psi) gas flow test facility which can: control a metering valve to maintain a prescribed pressure profile; acquire data from various transducers, e.g., strain, pressure, temperature, etc.; display data, a plot, and the system diagram during the test; and produce post experimental plots. The computerized gas metering system can perform limited suspensions and resumptions of an experimental run. When a test is suspended, a pressure profile can be changed and when the test is restarted, it will follow this new ramp. Finally, an operator can end a test prematurely by pressing either a VENT or an ABORT key on a terminal. With the vent option, data will be saved, with the abort option, data will be purged. This manual describes the responsibilities of the high pressure facility representative interacting with an experimenter, features of the gas metering system, and the procedure for running a test. (LCL)

59924 **(UCRL—50016-82-2) Mechanical Engineering Department technical abstracts.** Denney, R.M. (ed.). (Lawrence Livermore National Lab., CA (USA)). 1 Jul 1982. Contract W-7405-ENG-48. 34p. NTIS, PC A03/MF A01. Order Number DE82020614.

The Mechanical Engineering Department publishes listings of technical abstracts twice a year to inform readers of the broad range of technical activities in the Department, and to promote an exchange of ideas. Details of the work covered by an abstract may be obtained by contacting the author(s). Overall information about

current activities of each of the Department's seven divisions precedes the technical abstracts.

59925 **(UCRL—52000-82-8) Energy and technology review.** (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. 36p. NTIS (US Sales Only). Order Number DE82021538.

Portions of document are illegible.

Three areas of research are discussed: microcomputer technology applied to inspecting machined parts to determine roundness in ultraprecision measurements; development of an electrolytic technique for preparing dinitrogen pentoxide as a potentially less expensive step in the large-scale synthesis of the explosive HMX; and the application of frequency conversion to short wavelengths in the Novette and Nova lasers to improve the performance of inertial-confinement fusion targets. (GHT)

59926 **Method of extruding and packaging a thin sample of reactive material, including forming the extrusion die.** Lewandowski, E.F.; Peterson, L.L. (to Dept. of Energy). US Patent Application 326,087. 30 Nov 1981. 11p. Contract W-31-109-ENG-38.

This invention teaches a method of cutting a narrow slot in an extrusion die with an electrical discharge machine by first drilling spaced holes at the ends of where the slot will be, whereby the oil can flow through the holes and slot to flush the material eroded away as the slot is being cut. The invention further teaches a method of extruding a very thin ribbon of solid highly reactive material such as lithium or sodium through the die in an inert atmosphere of nitrogen, argon, or the like as in a glovebox. The invention further teaches a method of stamping out sample discs from the ribbon and of packaging each disc by sandwiching it between two aluminum sheets and cold welding the sheets together along an annular seam beyond the outer periphery of the disc. This provides a sample of high purity reactive material that can have a long shelf life.

59927 **Doppler flowmeter.** Karplus, H.H.B.; Raptis, A.C. (to Dept. of Energy). US Patent Application 321,345. 13 Nov 1981. 20p. Contract W-31-109-ENG-38.

A Doppler flowmeter impulses an ultrasonic fixed-frequency signal obliquely into a slurry flowing in a pipe and a reflected signal is detected after having been scattered off of the slurry particles, whereby the shift in frequencies between the signals is proportional to the slurry velocity and hence slurry flow rate. This flowmeter filters the Doppler frequency-shift signal, compares the filtered and unfiltered shift signals in a divider to obtain a ratio, and then further compares this ratio against a preset fractional ratio. The flowmeter utilizes a voltage-to-frequency convertor to generate a pulsed signal having a determinable rate of repetition precisely proportional to the divergence of the ratios. The pulsed signal serves as the input control for a frequency-controlled low-pass filter, which provides thereby that the cutoff frequency of the filtered signal is known. The flowmeter provides a feedback control by minimizing the divergence. With the cutoff frequency and preset fractional ratio known, the slurry velocity and hence flow will also be determinable.

59928 **Direct-contact closed-loop heat exchanger.** Berry, G.F.; Minkov, V.; Petrick, M. (to Dept. of Energy). US Patent Application 317,706. 2 Nov 1981. 30p. Contract W-31-109-ENG-38.

A high temperature heat exchanger is disclosed which has a closed loop and a heat transfer liquid within the loop, the closed loop having a first horizontal channel with inlet and outlet means for providing direct contact of a first fluid at a first temperature with the heat transfer liquid, a second horizontal channel with inlet and outlet means for providing direct contact of a second fluid at a second temperature with the heat transfer liquid, and means for circulating the heat transfer liquid.

59929 **Flowmeter for determining average rate of flow of liquid in a conduit.** Kennerly, J.M.; Lindner, G.M.; Rowe, J.C. (to Dept. of Energy). US Patent Application 258,971. 30 Apr 1981. 15p. Contract W-7405-ENG-26.

This invention is a compact, precise, and relatively simple device for use in determining the average rate of flow of a liquid through a conduit. The liquid may be turbulent and contain bubbles of gas. In a preferred embodiment, the flowmeter includes an electrical circuit and a flow vessel which is connected as a segment of the conduit conveying the liquid. The vessel is provided with a valved outlet and is partitioned by a vertical baffle into coaxial chambers whose upper regions are vented to permit the escape of gas. The inner chamber receives turbulent downflowing liquid from the conduit and is sized to operate at a lower pressure than the conduit, thus promoting evolution of gas from the liquid. Lower zones of the two chambers are interconnected so that the downflowing liquid establishes liquid levels in both chambers. The liquid level in the outer chamber is comparatively calm, being to a large extent isolated from the turbulence in the inner chamber once the liquid in the outer chamber has risen above the liquid-introduction zone for that chamber. Lower and upper probes are provided in the outer chamber for sensing the liquid level therein at points above its liquid-introduction zone. An electrical circuit is connected to the probes to display the time required for the liquid level in the outer chamber to successively contact the lower and upper probes. The average rate of flow through the conduit can be determined from the above-mentioned time and the vessel volume filled by the liquid during that time.

59930 **(EDF-R—81H330210) Realistic limits of buckling of revolution shells showing different Gauss curvatures.** Eckstein, U.; Kraetzig, W.B.; Wittek, U. (Electricite de France, 92 - Clamart. Direction des Etudes et Recherches). May 1979. Translation of the report 79-5 from Institut fuer Konstruktiven Ingenieurbau, Rhur-Universitaet, Bochum, Germany, F.R. 177p. (In French). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82702389.

Buckling and post buckling behaviour is studied as are the vibrations of axisymmetrical, low curvature, shells subjected to axial or lateral pressure. The application of the stability concept of "buckling states almost without dilatation" based on the behaviour difference between the incremental membrane energy and the bending energy during the buckling process, makes it possible to establish, in a reliable manner, by means of a linear calculation the critical inertial loads as well as the minimal post buckling loads. Hence, buckling load limits, depending on the Gauss K curvature, are determined, as from which it is possible to formulate a universal application test of the overall sensitivity to imperfections.

4203 Lasers

REFER ALSO TO CITATION(S) 59925, 60601

59931 **(AD-A—112177/1) An unpolarised electro-optically q-switched laser. Technical report.** Richards, J. (Electronics Research Lab., Adelaide (Australia)). Aug 1981. 15p. (ERL—0213-TR). NTIS, PC A02/MF A01.

A novel laser design is given that uses a special polarising device to generate unpolarised Q-switched laser energy with a conventional electro-optic Pockels cell. The special polarising device, which replaces the linear polariser normally used in conventional Q-switched resonators, allows solid state lasers to operate efficiently at high repetition rates. Other features of the design include the elimination of the beam non-uniformities that normally occur at high repetition rates, the elimination of the need to bias the Pockels cell and the ability to produce, by a simple mirror realignment, a plane polarised output with high efficiency.

59932 **(AD-A—112178/9) An improved prism for use in laser resonators. Technical memo.** Richards, J. (Electronics Research Lab., Adelaide (Australia)). Aug 1981. 16p. (ERL—0212-TM). NTIS, PC A02/MF A01.

The use of compound total internal reflection prisms rather than Porro prisms in polarisation coupled lasers is proposed. Performance advantages resulting from the use of these prisms include higher output without the need to bias the Pockels cell, ability to give a larger range of output coupling and independence of performance on the refractive index of the prism. In conventional Q-switched lasers the use of the prism at the Pockels cell end of the resonator instead of the usual 100% reflecting mirror also leads to some advantages including better hold-off, elimination of the need

to bias the Pockels cell and insensitivity in one plane to angular misalignment.

59933 **(AD-A—112398/3) Time dependent pulse amplification in a three level gas. Annual report 1 Jan-31 Dec 80.** Morse, T.F. (Brown Univ., Providence, RI (USA). Dept. of Engineering). Dec 1980. 47p. NTIS, PC A03/MF A01.

The time dependent density matrix equations have been solved in conjunction with the field amplitude equations for a three level optically pumped gas. The solutions are valid in the limit in which the pumping pulse is longer than the dephasing time of the system and true coherent effects may be neglected. It is assumed that the FIR field is smaller than the pump field, and saturation effects associated with this field are absent. In the limit in which the pump pulse is resonant, particularly simple results for the FIR field amplification may be obtained. The solutions exhibit the dependence of the FIR output pulse on the shape of the input pulse. Further, as a consequence of non-linear saturation effects on the pump pulse transition, the FIR pulse is initially created with two peaks, one associated with the leading edge and one with the trailing edge of the pump pulse. As amplification on the FIR transition and pump absorption increase, these two peaks merge.

59934 **(AD-A—112415/5) Tunable wavelength solid-state lasers and turbulent jet diagnostics by Rayleigh and fluorescence scattering. Final report 1 Sep 77-30 Sep 81.** Chang, R.K. (Yale Univ., New Haven, CT (USA)). Sep 1981. 55p. NTIS, PC A04/MF A01.

Broadly tunable solid-state lasers in the blue-green appeared to be feasible for Eu(2+) and Ce(3+) ions doped in several host crystals. While the optical absorption and fluorescence were encouraging, our results on excited-state absorption indicated that laser action from many of the crystals considered by our group and other laboratories is not possible. Based on our results, a general guideline can be established for screening the existence of excited-state absorption from known linear absorption and fluorescence spectra, thereby alleviating the need to perform excited-state absorption experiments for each crystal. Ce(3+) ions doped in A_2BYF_6 (A = Cs or Rb and B = Na or K) crystals possess low excited-state absorption, broad fluorescence bands in the blue-green, and pump bands easily accessibly with N_2 or XeCl lasers. Purification and growth procedures for synthesizing single crystals of Cs_2KYF_6 and Kb_2KYF_2 doped with 0.01% Ce(3+) ions are presented.

59935 **(BNL—31684) Generators of coherent radiation from relativistic electrons.** Pellegrini, C. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 10p. (CONF-820475—1). NTIS, PC A02/MF A01. Order Number DE82020370.

From Conference on new horizons on electromagnetic physics; Charlottesville, VA, USA (21 Apr 1982).

We discuss the production of coherent electromagnetic radiation from an electron beam in a storage ring and some of the possible applications of this radiation. Coherent radiation production can be obtained with a free electron laser and this gives a number of photons per unit time and wavelength six or more order of magnitude larger than that obtained from incoherent synchrotron radiation. We consider the use of a free electron laser to produce a nearly monochromatic γ-ray beam by Compton backscattering on an electron beam of a storage ring.

59936 **(LA-UR—82-2374) Calculations of three-dimensional distributions of current density, electric field, and power deposition in externally sustained electrical discharges.** Leland, W.T.; Kircher, M. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 42p. (CONF-820517—2). NTIS, PC A03/MF A01. Order Number DE82021880.

From IEEE international conference on plasma science; Ottawa, Canada (17 May 1982).

Portions of document are illegible.

In the design of larger and larger CO_2 laser amplifiers, the problem of attaining the ideal uniform discharge in these large discharge volumes becomes increasingly difficult and expensive to solve. The practical solution is a compromise between uniformity and other design considerations. In order to judge the adequacy of each compromise, a method of predicting the distribution of current density and electric field throughout the discharge volume is needed. When these electrical distributions are known, population inversions can be calculated and the amplifier performance evaluated. This report describes a method of calculating the three-dimensional distributions of electric field and current density for externally sustained discharges. Two-dimensional calculations have been reported previously.

59937 **(UCRL—87964) Oxide and halide laser glasses.** Weber, M.J. (Lawrence Livermore National Lab., CA (USA)). 30 Jul 1982. Contract W-7405-ENG-48. 31p. (CONF-820743—1). NTIS, PC A03/MF A01. Order Number DE82020162.

From 2. international otto schott colloquium; Jena, F.R. Germany (12 Jul 1982).

Optical and spectroscopic properties of oxide and halide glasses are compared for optically-pumped laser applications. Properties considered include the transparency, linear and nonlinear refractive indices, and damage threshold of the host glass and the absorption spectrum, radiative and nonradiative transition probabilities, fluorescence wavelength, stimulated emission cross sections, and spectroscopic inhomogeneities of the lasing ion. Most of these properties exhibit systematic variations with glass composition which can be used to tailor laser parameters. Measured properties for the 4/sub F//sub 3/2 $\rightarrow$ ^{4}I/sub 11/2/ lasing transition of Nd^{3+} are surveyed for oxide (silicate, phosphate, borate, germanate, tellurite), halide (fluoroberyllate, fluoroaluminate, fluorozirconate, fluorohafnate, chloride), and oxyhalide (fluorophosphate, chlorophosphate) glasses.

59938 **Laser mirror and method of fabrication.** Gowan, J.G.; Shilito, K.R. US Patent Application 342,996. 27 Jan 1982. 21p.

An improved laser mirror and heat exchanger and method of fabrication is described which comprises, in a preferred embodiment thereof, a carbon/carbon fiber matrix substrate having deposited thereon a transitional composition layer of carbon and tungsten carbide, and one or more layers of tungsten or tungsten carbide. These layers define a desired network of coolant passageways formed by depositing a low melting point material, such as antimony, in a raised pattern and thereover depositing the tungsten-containing layer, and subsequently melting out the low melting point material. The tungsten-containing layer may then be polished on the exposed surface to a laser mirror finish.

59939 **Chemical laser nozzle blade support system.** Wells, J.D. US Patent Application 322,042. 16 Nov 1981. 19p.

A chemical laser nozzle blade support system is described which incorporates therein at least two continuous flexure member to secure the nozzle blades of the laser to the laser body. The blade and flexure member are formed with a radius, R, and each side of the member is supported by a surface having a radius, R1. Under nonstress conditions the blade and member are subjected to the same pressure and have the same radius of curvature. During operation of the laser, axial deflections occur which cause the blade end of the member to deflect in a radial manner which induces bending in the member. The magnitude of the bending stress is limited by establishing the value of R1 such that the change in radius of curvature cannot exceed a desired value. The resulting blade load is therefore primarily in tension with the only bending being that induced by the structural deflection.

59940 **Output coupler for laser resonator.** Lundstrom, E.A. US Patent Application 302,346. 15 Sep 1981. 14p.

A laser output coupler utilizes a birefringent lens which has one side thereof curved so as to present a non-uniform polarization distribution across the face of the lens. A polarized beam splitter is employed to separate the output beam from the feedback beam; the feedback beam having a non uniform distribution across the laser aperture enhances mode discrimination of a pulsed resonator.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 59618, 59923, 59927, 59929

59941 (CEA-CONF—5965) Triton computer code finite difference methods for one dimensional single or two-fluid flow transient computation. Le Coq, G.; Libmann, M.; Raymond, P.; Souchet, Y.; Sursock, J.P. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service d'Etudes des Reacteurs et de Mathematiques Appliquees). Mar 1981. 19p. (CONF-810307—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702369.

From 3. specialist meeting on transient two-phase flow; Pasadena, CA, USA (23 Mar 1981).

In this paper two new numerical methods for computing two phase flow transients are presented. One method uses a semi-implicit technique and the other one applies a fully implicit technique. A computer module Triton has been developped using these two methods. The physical modeling of this code is the two fluid flow model with six partial differential equations, the various transfer terms between wall and fluid or between liquid and steam are given by correlations implemented into the Poseidon Nuclear Safety Analysis Computer code system.

59942 (CISE—1723) A summary of Centro Informazioni Studi Esperienze's (CISE) activities on two-phase flow. Brusa, L.; Sandri, C. (Centro Informazioni Studi Esperienze, Milan (Italy)). 1981. 18p. (CONF-8109169—). NTIS, PC A02/MF A01.

From 5. international symposium on water column separation; Obernach, F.R. Germany (28 Sep 1981).

Research into the fluid dynamics of single and two phase water flow is discussed. The definition, realization, elaboration, and analysis of thermal hydraulic plants are considered. The use of experimental test loops and special instrumentation is described. Increasingly complicated dynamic experiments necessitate sophisticated mathematical modeling. The development of relevant thermal hydraulic models and their implementation in computer codes is surveyed.

59943 (CONF-820604—12) Calculations and measurements of the flow in a motored model engine and implications for open-chamber direct-injection engines. Ahmadi-Befrui, B.; Arcoumanis, C.; Bicen, A.F.; Gosman, A.D.; Jahanbakhsh, A.; Whitelaw, J.H. (Imperial Coll. of Science and Technology, London (UK). Dept. of Mechanical Engineering). Oct 1981. Contract AC04-81AL17117. 37p. NTIS, PC A03/MF A01. Order Number DE82019033.

From AIAA/ASME joint conference on fluids, plasma, thermophysics and heat transfer; St Louis, MO, USA (7 Jun 1982).

Portions of document are illegible.

The purposes of this paper are to present and compare computer calculations and measurements of the velocity characteristics of the flow in axisymmetric, four-stroke model engine and with the consequent knowledge of the precision of the calculation method, to report further predictions which are of relevance to open-chamber, direct-injection engines. The calculations are performed with the rpm multi-dimensional prediction method, which solves the governing equations in a flexible curvilinear coordinate frame with turbulence effects represented by a two-equation (k-ϵ) turbulence model. The results are compared with measurements obtained by laser-Doppler anemometry in a plexiglass cylinder with a flat piston, centrally-located valve with 60° seat angle and non-swirling inlet flow, operating at 200 rpm and a compression ratio of 3.5. Moderate overall agreement is obtained between data and predictions, which collectively show that a strong highly-turbulent twin-vortex structure is produced during induction, but commences to decay rapidly around inlet valve closure. The mean motion continues to fall to a low level during compression, but the turbulence intensity attains an approximate constant level of about 0.6 times the mean piston speed, as also observed in other engine configurations. It is concluded that this decay process is one of the motivations for inducing longer-lived swirl motions in direct-injection engines and later augmenting these with squish, and it is suggested that calculation methods can assist in optimizing the fluid dynamics in such engines.

59944 (INIS-mf—7075) Growth of condensed particles at fast cooling-down of moist air in a laval nozzle. Krause, B. (Technische Hochschule Aachen (Germany, F.R.). Sonderforschungsbereich 83 Stroemungsmechanik und Thermogasdynamik). (Technische Hochschule Aachen (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 27 Jun 1980. 124p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780680.

Thesis.

The aim of the investigations was to clarify the uncertainty factors contained in the condensation theories as well as to examine different existing growth laws. The measuring method chosen for the study of the progress of condensation was the measurement of the static pressure along the nozzle axis. The investigation of the condensation products with respect to size and number was performed by means of intensity measurements of scattered laser light. The two parameters initial moisture and cooling speed substantially influencing condensation were varied over a wide range. As the scattering behavior of the ice particles formed as condensation products could be described by the Rayleigh-Debye theory, determination of size and number of the condensing particles at every position of the nozzle axis became possible. For the first time particle growth in the nozzle was studied in detail. The results were compared with a number of growth laws.

59945 (JUEL—1739) Flow and heat transfer in packed beds at low Reynolds numbers. Takizuka, T. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente). Sep 1981. 48p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82906232.

Numerical analyses are described for the flow and heat transfer in packed beds at low Reynolds numbers. An analytical model consists of an infinitely large packed bed of regularly arrayed circular cylinders. Assuming symmetry and periodicity of flow and temperature fields, the coupled Navier-Stokes equations and energy equation were solved numerically using a finite difference approach. The computational procedure and typical examples of numerical results are presented.

59946 (PB—82-180266) Interfacial exchange relations for two-fluid vapor-liquid flow: a simplified regime map approach. Final report. Kelly, J.E.; Kazimi, M.S. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). May 1981. 52p. (MIT-EL—81-024). NTIS, PC A04/MF A01.

A simplified approach is described for selection of the constitutive relations for the inter-phase exchange terms in the two-fluid code, THERMIT. The approach used distinguishes between pre-CHF and post-CHF conditions. Interfacial mass, energy and momentum exchange terms are selected and tested against one dimensional measurements for a wide range of mass flow rate, pressure and void fraction conditions. It is concluded that the simplified regime map approach leads to accurate predictions for LWR applications, excluding depressurization events.

4205 Materials Testing

59947 (CEA-CONF—6007) Disc breaking testing. A powerful method for the determination of mechanical properties. Arnould-Laurent, R.; Fidelle, J.P. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Sep 1981. 25p. (In French). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702382.

From 2. Conference on the environmental degradation of engineering materials; Blacksburg, VA, USA (21 - 23 Sep 1981).

Characterization of the intrinsic or provoked brittlenesses in a wide range of experimental conditions: temperature, deformation rate, slow fatigue, permeability to hydrogen, specific parameters (welding for ex.) The use is rapid and inexpensive. The breaking or cracking pressure of discs set in at their periphery is measured and the pressures obtained in conditions of embrittlement and in a reference environment are compared. The possibility of using or not using the material in the given conditions is then deduced as is the reproducibility of its response to these conditions.

59948 **(UCRL—87805) Digital ultrasonic signal processing techniques used for the clarification of ultrasonic signals.** McKinney, R.L. (Lawrence Livermore National Lab., CA (USA)). Jul 1982. Contract W-7405-ENG-48. 6p. (CONF-821020—1). NTIS, PC A02/MF A01. Order Number DE82019244.

From American Society Non-destructive Testing conference; Philadelphia, PA, USA (4 Oct 1982).

Portions of document are illegible.

A curve fitting procedure which uses a cubic spline algorithm has been investigated using digital ultrasonic signals for the purpose of digitally changing the original sample interval. Once an analog ultrasonic signal is digitized at one sample interval a set of cubic spline coefficients are calculated that specify the ordinate values of the signal at any sample interval. Specifying the sample interval allows more flexibility in three areas; one, specifying the maximum frequency and resolution when performing data transformations such as Fourier transforms; two, empirically determining the minimum number of datum required to specify ultrasonic signals; three, smoothing a given ultrasonic signal which will have an effect on the noise located within that signal.

4206 Safety Engineering

REFER ALSO TO CITATION(S) 60203, 60286

59949 **(DOE/EP—0056/1) Summary of property damage control program of the United States Department of Energy CY 1981.** (USDOE Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness, Washington, DC. Office of Operational Safety). Sep 1982. 55p. NTIS, PC A04/MF A01. Order Number DE82021215.

Portions of document are illegible.

Calendar year 1981 was the fourth full year of operation of the Department of Energy. This report summarizes the loss experience in overall terms and itemizes facility and program achievements in property protection. Planned projects for CY 1982 are included and several subjects of interest to loss-control specialists are discussed in detail. Property damage from all causes was approximately $4.6 million, of which $2.1 million was due to fire, the major single cause of losses in both the Department of Energy and its predecessor agencies. Combined losses for 4 full years of Department of Energy experience total almost $33 million, of which over $17 million is due to fire. The fire loss ratio for 1981 was about 0.34 cents for each one hundred dollars of property values at risk, or about one-tenth of the loss ratio generally experienced by the best class of insured private industry.

59950 (UCRL—50007-81, pp 41-44) **Fault-tree analysis of a smoke detector system at LLNL.** Hasegawa, H.K.; Naanep, G.P.; Magee, M.W. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

We have completed an analysis of a products-of-combustion (POC) smoke detector system, typical of those installed at LLNL, to aid the Fire Safety Division. The program objective was to identify probable fault modes in a representative LLNL smoke-detector circuit. Results of this study will help in designing future systems, modifying existing systems, and selecting critical circuit components. Furthermore, recommendations can be made for optimizing inspection and maintenance schedules.

4207 Vacuum Engineering

59951 **(UCRL-Trans—11788) Extended arc-type titanium evaporators.** Bender, E.D. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. Translation of Preprint 81-46, Institute of Nuclear Physics, Novosibirsk, USSR. 12p. NTIS, PC A02/MF A01. Order Number DE82020332.

Portions of document are illegible.

A pulsed titanium getter-type vacuum pump is described. The cathode spot of the pulsed arc is moved around the titanium surface uniformly by applied magnetic fields. (GHT)

59952 **(UCRL-Trans—11789) Pulsed sorption pump with an extended electric-arc titanium evaporator.** Bender, E.D. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. Translation of Preprint 81-45, Institute of Nuclear Physics, Novosibirsk, USSR. 9p. NTIS, PC A02/MF A01. Order Number DE82020334.

Portions of document are illegible.

Electric-arc sorption pumps are convenient for use in vacuum systems using pulsed gas release because of their high rate of titanium evaporation and their inertialessness. The pump described here, which uses arc evaporation of titanium, is designed for pumping down atomic hydrogen beam injectors whose operating cycle lasts for 0.2 to 0.5 s[,] and is characterized by an inleakage rate of up to 10 l-torr/s.

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 59784, 60100, 60102, 60103, 60104

59953 **(BDX—613-2819) Channel plating.** Evans, M.E. (Bendix Corp., Kansas City, MO (USA)). Sep 1982. Contract AC04-76DP00613. 31p. NTIS, PC A03/MF A01. Order Number DE82021687.

A system for applying thick coatings of photoresist to thin copper-clad laminate for manufacturing printed wiring boards (PWBs) was developed. Using this system, circuits were made with narrow conductors and spacing. Although plating within the channels defined by the resist was successful, circuit fabrication was precluded because of defective laminate materials. Laminate materials clad with copper 0.005 and 0.009 mm thick were found to have a high incidence of foreign metallic inclusions.

59954 (INIS-SU—103, pp 71-73) **Approach to synthesis of the passive circuits in the wide-band amplifiers.** Volkov, Yu.A.; Kondratenko, S.V.; Korolev, V.A. 1980. (In Russian). Dep. NTIS (US Sales Only).

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

The algorithm of calculation of optimum circuits of the wide-band amplifier in hybride-film form is described. The sought-for circuit of unknown configuration is preset by a fraction-rational function of the Laplace-Carson operator. The realization of positive real functions in the general case leads to RLC circuits. As an example the algorithm of realization of the Foster RC-circuit of type I is considered.

59955 **(SAND—82-0856C) Breakdown time of a triggered vacuum and low-pressure switch.** Wilson, J.M.; Boxman, R.L.; Thompson, J.E. (Sandia National Labs., Albuquerque, NM (USA); South Carolina Univ., Columbia (USA). Coll. of Engineering). 1982. Contract AC04-76DP00789. 4p. (CONF-821024—1). NTIS, PC A02/MF A01. Order Number DE82019735.

From 10. international symposium on discharges and electrical insulation in vacuum; Columbia, SC, USA (25 Oct 1982).

Portions of document are illegible.

Characterization of a triggered vacuum and low-pressure switch has been performed with breakdown performance data gathered for different trigger locations and current levels, gas pressures, and main gap voltages and currents. Results presented here reveal a dependence of breakdown or switch closure time on the switched current level rather than main gap voltage, for gap spacings from 1.5 to 10 mm. Breakdown time has been found to increase sharply with increases in switched current levels up to 0.8 kA, then remain constant or change slightly for current level increases up to 6 kA. In other tests, increasing the trigger current from 0.23 kA to 0.7 kA has been found to halve the breakdown time of the switch over a wide operating range. Also, the introduction of hydrogen, nitrogen, and argon, at pressures above 10^{-3} torr, resulted in shorter total breakdown times.

59956 **(SAND—82-1088C) Application of the perfluorocarbon liquid/plastic-film-capacitor technology to repetitive-discharge pulse-power systems.** Mauldin, G.H.; Nunnally, W.C.; Sarjeant, W.J. (Sandia National Labs., Albuquerque, NM (USA); Los Alamos National Lab., NM (USA); State Univ. of New York, Buffalo (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-821013—1). NTIS, PC A02/MF A01. Order Number DE82016723.

From Conference on electrical insulation and dielectric phenomena; Amherst, MA, USA (17 Oct 1982).

A joint program has been initiated between the Los Alamos National Laboratory and the Sandia National Laboratories to evaluate and refine the Sandia perfluorocarbon/plastic-film-capacitor technology for application in repetitively operated, pulse-discharge, energy-storage service. The goal of this effort is continuous operation to 100 Hz with lifetimes approaching 10^8-10^9 charge-discharge cycles at 99.99% reliability and at the highest energy density possible. The facilities at Sandia and Los Alamos for evaluating the effects of different variables, e.g. capacitor roll tightness and gas loading of impregnants, on capacitor performance and test programs which will be run are discussed. (LCL)

59957 **(SAND—82-1838C) Small-gap experiments in magnetically insulated transmission lines.** Stinnett, R.; Palmer, M.; Spielman, R. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-821027—1). NTIS, PC A02/MF A01. Order Number DE82020101.

From 5. annual pulsed power conference; Columbia, SC, USA (25 Oct 1982).

Magnetic insulation is a pulsed power technique which makes possible very high-power-density ($\sim 10^{16}$ W/m^2) transmission lines. Explosive emission occurs at the cathode surface when the electric field in the magnetically insulated transmission line (MITL) exceeds 2.5×10^7 V/m. This causes the formation of a plasma sheath covering the cathode surface. Electrons from this cathode plasma could lead to gap breakdown, but magnetic fields in the lines constrain these electrons to move in cycloidal orbits which do not reach the anode. Recently it was found that negative ions are produced at the cathode of MITL's due to the presence of a cathode plasma. Because of their relatively large masses, negative ions are accelerated across the anode-cathode (A-K) gap without significant deflection by the magnetic field. This negative ion current is both a mechanism for energy loss and a possible cause of anode plasma formation.

4209 Waste Processing Plants And Equipment

59958 **(DOE/ER/10088—T1) Computer model for analysis & determination of energy self-sufficiency in wastewater treatment plants.** Carson, J.R. (Energy Research and Applications, Inc., El Segundo, CA (USA)). 30 Oct 1979. Contract FG05-79ER10088. 45p. NTIS, PC A03/MF A01. Order Number DE82021991.

Portions of document are illegible.

A computer model was developed which performs the following calculations: estimates the gas flow rate and energy available from anaerobic digestion of sewage sludge; calculates electrical and thermal energies producible by burning the available digester gas in a recuperated gas turbine engine; established theoretical potential for energy self-sufficiency in both electricity and steam usage by comparing the energy producable to the energy demands of plant; and calculates rate of return and straightline payback for an investment in a cogeneration system at a given treatment plant. The computer model was tested at two wastewater plants in California. The results show that the computer model described provides a tool to determine whether any selected wastewater treatment plant has the theoretical potential to become energy self-sufficient with acceptable accuracy. The answer for the two plants used for model verification is no - at least not with current energy use patterns. However, the increasing use of energy-intensive secondary biological treatment, combined with sharply increasing power prices, may speed the utilization of energy production on-site by wastewater treatment processes, thereby enabling the typical plant to come closer to fulfilling its own energy requirements.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 59143, 59463

59959 **(DOE/FC/10281—1) Material balance in atmospheric fluidized-bed combustion of North Dakota lignite.** Hall, R.R.; McCabe, M.M.; McGrath, D. (GCA Corp., Bedford, MA (USA). GCA Technology Div.). Mar 1982. Contract AC18-81FC10281. 134p. NTIS, PC A07/MF A01. Order Number DE82020853.

Portions of document are illegible.

The distribution of 24 trace and minor elements in the feed and exit streams from a fluidized-bed combustor equipped with a pulse-jet baghouse for particulate control was investigated. Lignite feed was the major source of aluminum, barium, beryllium, iron, sodium and titanium entering the combustor. The limestone feed was the major source of calcium, magnesium and manganese entering the combustor. Both lignite and limestone were significant sources of chromium, cobalt, nickel, potassium, silicon, vanadium and zinc. Most of the elements left the combustion system in either the primary cyclone catch or the bed drain. The secondary cyclone and baghouse collected most of the remaining trace and minor elements. Particulate emissions to the atmosphere were very low ranging from 0.00026 to 0.00040 lb/10^6 Btu. Emissions of trace and minor elements, which were also very low, are presented in this report.

59960 **(DOE/NASA/0145—1) Low-NO/sub x/ heavy-fuel-combustor concept program.** White, D.J.; LeCren, R.T.; Batakis, A.P. (Solar Turbines, Inc., San Diego, CA (USA)). Nov 1981. Contract AI01-77ET13111. 91p. (NASA-CR—165481). NTIS, PC A05/MF A01. Order Number DE82021957.

Three concepts were evaluated: they were (1) a rich primary zone coupled to a lean secondary zone; (2) a modified conventional combustor; and (3) a lean primary zone with a premixed fuel-air charge. Of these, the first was intended to provide a low NOx when burning fuels with high chemically bound nitrogen levels; while the lean premixed system was intended to provide ultralow NOx with clean fuels. The modified conventional system was intended to provide both a basis to evaluate the performance of the other two and to investigate the effects of droplet size on emissions. Three fuels were utilized during the experimental evaluation; these being ERBS fuel (approximately Diesel No. 1), Solvent Refined Coal (SRC-II) and residual fuel oil. The SRC-II had fuel-bound nitrogen levels of the order of 1.0% by weight while ERBS had less than 0.02% and residual approximately 0.3%. The emphasis of the program was placed mainly on obtaining low NOx with both residual and coal derived fuels (SRC-II) which have high levels of chemically bound nitrogen utilizing various versions of the rich-lean concept. NOx levels obtained with the rich-lean system although above the baseline program goals when burning SRC-II were below the corrected EPA requirements for industrial gas turbines. The operating conditions of the combustors evaluated were typical of a 12:1 industrial gas turbine. EPA NOx limits for such engines were obtained by correcting the base limit of 75 ppm corrected to 15% O_2 for the nitrogen level in the fuel and for the efficiency of the overall system. Typical EPA limits for NOx for existing cogeneration/combines cycle engine systems are of the order of 300 ppm for SRC-II and 160-170 for ERBS type fuels.

59961 **(DOE/NASA/10350—33) Techniques for enhancing durability and equivalence-ratio control in a rich-lean, three-stage ground power gas turbine combustor.** Schultz, D.F. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1982. Contract AI01-77ET10350. 11p. (NASA-TM—82922; CONF-821018—1). NTIS, PC A02/MF A01. Order Number DE82018241.

From American Society of Mechanical Engineers conference on power generation; Denver, CO, USA (17 Oct 1982).

This effort summarizes the work performed under Task IV, Sector Rig Tests of the CRT - Critical Research and Support Technology Program, a Department of Energy funded project. The rig tests of a can-type combustor were performed to demonstrate

two advanced ground power engine combustor concepts; steam-cooled rich-burn combustor primary zones for enhanced durability; and variable combustor geometry for three-stage combustion equivalence-ratio control. Both concepts proved to be highly successful in achieving their desired objectives. The steam cooling reduced peak liner temperatures to less than 800 K. This offers the potential of both long life and reduced use of strategic materials for liner fabrication. Three degrees of variable geometry were successfully implemented to control airflow distribution within the combustor. One was a variable-blade-angle axial-flow air swirler to control primary airflow while the other two consisted of rotating bands to control secondary and tertiary or dilution air flow.

59962 **Theoretical study of ignition in the Laminar mixing layer.** Law, C.K.; Law, H.K. (Department of Mechanical and Nuclear Engineering, Northwestern University, Evanston, Illinois 60201). *Journal of Heat Transfer;* **104**: No. 2, 329-337(May 1982).

The structure of the weakly reactive states leading to ignition in the laminar mixing layer flow is studied both analytically and numerically. It is shown that the flow consists of a reactive region and a self-similar frozen region, that the reactive region is intrinsically nonsimilar because of its excessively slow diffusion rate, and that the ignition characteristics are primarily governed by the velocity of the hot stream and therefore minimally dependent on the velocity distribution. Fundamental functional groups are identified, and an explicit prescription is activation energy reactions, for the evaluation of the minimum streamwise distance to achieved ignition.

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 59135

59963 **(ANL/ECT-TM—5) Performance model for fabric filtration: fractional collection efficiency and cleaning effects.** Farber, P.; Swietlik, C.; Reynolds, J.; Theodore, L. (Argonne National Lab., IL (USA)). Aug 1982. Contract W-31-109-ENG-38. 82p. NTIS, PC A05/MF A01. Order Number DE82022157.

The ultimate objective is the development of a model, or series of models, starting with a fundamental study of the mechanics of filtration and culminating with a viable method to predict baghouse behavior (specifically, baghouse collection efficiency and distribution of particle sizes at the outlet as functions of time). In this report, a brief review of the literature is followed by detailed descriptions of what are referred to as the molecular model, the microscopic model, and the macroscopic model. The molecular model presents fundamental equations from which single-collector efficiencies may be determined. The microscopic approach results in a method to describe in theoretical terms the collection efficiency and performance of an assemblage of single collectors, viz., the combined filter medium and deposited cake. The macroscopic model - which is an attempt to represent actual baghouse behavior by correlating the theoretical results of the microscopic model with bench-scale, pilot-plant and field-test data - is as yet incomplete and is described in this report in qualitative rather than in quantitative terms. It is recommended that the microscopic model be used as the starting point in the development of a practical model, and that corrections based on empirical correlations be added. A technique is described for treating particle-size distributions and calculating the resulting collection efficiency and distribution of particle sizes at the outlet. Suggestions for future work on the project are also presented.

59964 **(PB—82-196361) Performance of a high-velocity pulse-jet filter, III. Final report Sep 79-Sep 80.** Leith, D.; Ellenbecker, M.J.; First, M.W. (Harvard Univ., Boston, MA (USA). School of Public Health). Mar 1981. 44p. NTIS, PC A03/MF A01.

The report gives results of a continuing study of the performance of a high-velocity pulse-jet filter. Such filtration has distinct advantages over low-velocity filtration in that the equipment required to clean a gas stream is reduced in size and initial cost as filtration velocity increases. Although high filtration velocity brings on a number of problems, some of them can be dealt with using the information in this report. The study indicates that penetration by particle collection and subsequent seepage (not straight-through penetration) is the primary mechanism by which penetration occurs. A model is presented which encompasses both mechanisms. The model was useful in showing the general trends that should occur with changes in filter operating conditions, but additional information is required to test its ability to predict penetration. Tests were designed to measure the actual fraction of fly ash removed from a polyester felt under typical pulse-jet conditions. Test results showed that failure to remove dust with the cleaning pulse, as well as redisposition, contributed to high pressure drop in pulse-jet filters with nonwoven fabrics.

59965 **(IAEA-R—1815-F) Generation of aerosols for filter efficiency testing in nuclear installations. Final report for the period 1 June 1976 - 31 October 1980.** Jovanovic-Kovacevic, O. (International Atomic Energy Agency, Vienna (Austria)). [nd]. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702374.

The purpose of the Research Contract No. 1815 was to develop a new method of sodium chloride aerosol generation for filter efficiency testing in nuclear installations. The first phase of the study was devoted to the development of a suitable aerosol generator. The first NaCl aerosol generator enabled determination of the influence various parameters like nozzle diameter, air flow rate, NaCl concentration in solution, solution temperature, etc., on the generation capacity and aerosol characteristics. The drawbacks of this generator were removed by modifying the design. Sodium chloride aerosol concentration was measured by means of a portable sodium flame photometer, and the particle size distribution was determined by a six-stage Andersen cascade impactor. For particle shape analysis electron microscopy was used. By using the aerosols generated the efficiency of air filters was tested. The results showed that the optimum parameters for atomization of ^{24}NaCl solution are: Nozzle diameter $0.5x10^{-3}$m; compressed air pressure 196.132kPa; air flow rate $6.1x10^{-5}m^3/s$. Under these conditions test aerosols of $0.335x10^{-6}$m mass median diameter were obtained with a geometrical standard deviation, sigma=2.04. Preliminary high efficiency particulate air filter tests with the above ^{24}NaCl aerosols showed the minimum filter penetration of the order of $5x10^{-5}$% with a relative standard deviation not exceeding 15%. This showed that the ^{24}NaCl aerosol generated from liquid phase can be successfully used for filter testing in nuclear installations.

43 PARTICLE ACCELERATORS

59966 **Physics of high-energy particle accelerators (Fermilab Summer School, 1981).** Carrigan, R.A.; Huson, F.R.; Month, M. (eds.). New York, NY; American Institute of Physics (1982). 973p. (CONF-810774—). American Institute of Physics, 335 East 45th Street, New York, NY 10017.

From Summer school on high energy particle accelerators; Batavia, IL, USA (13 Jul 1981).

Topics covered by this workshop include: introduction to accelerator theory; single beam coherent instabilities in circular accelerators and storage rings; lectures on nonlinear orbit dynamics; luminosity in electron-positron colliding-beam storage rings; the dynamics of the beam-beam interaction; polarization of a stored electron beam; high energy linacs, application to storage ring rf systems and linear colliders; stochastic cooling; electron cooling; superconducting magnets; storage ring design; interactions between electromagnetic fields and electrons; and collective field accelerators. (GHT)

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 59635, 60362

59967 (INIS-SU—31, pp 5-11) **Compact standing-wave electron linac with a bri ge circuit of a power supply.** Vikulov, V.F.; Zverev, B.V.; Zavadtsev, A.A. 1980. (In Russian). NTIS (US Sales Only).

In Accelerators. No. 19. Theory calculation experimental works on charged particles accelerators.

Experimental data obtained on a compact three-section standing-wave electron linac are presented. The linac has a self-contained power supply through a 8 db directed branched coupler. The total lenght of the accelerating system is 86 cm. A two-electrode 40 kV gun with interchangeable directly and indirectly cathodes serves as an injector. The maximum energy of the beam is 5.1 MeV at the 10 mA beam current. The maximum beam current is 115 mA at the capture coefficient of 29%. At the optimal focusing magnetic field of 550 Oe the beam diameter at the output is 4 mm.

59968 (INIS-SU—62, pp 37-50) **Industrial megavolt electron accelerators.** Abramyan, E.A. (AN SSSR, Moscow. Inst. Vysokikh Temperatur). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Peculiarities of direct-voltage accelerators for use in industry have been considered. Presented are flowsheets and shown are main structural peculiarities of high-voltage generators on the basis of axial-symmetrical transformers: a transformer with the isolated core, electron transformer, transformer-rectifier, transformer with shock excitation. Given are flowsheets of high-voltage generators: stage multiplier, step-by-step generator and Dynamitron. It is shown that at 100 kW power generators on the base of three-phase transformers are preferrable. Some flowsheets of electron-optical systems for beam acceleration are given as well. It is noted that at present the direct-voltage accelerators amount to 90% of the total number of electron accelerators used in facilities for radiation-technology.

59969 (INIS-SU—62, pp 157-169) **Waveguide electron linacs for industry and medicine.** Vakhrushin, Yu.P.; Val'dner, O.A. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Results of quantitative analysis of the application of wave quide electron linacs in national economy and medicine are given. It is shown that characteristic parameters of this type accelerators are (2-40)MeV energy of accelerated electrons, (10^{-4}-10^{-2}) A mean beam current. Technical-and-economical investigations have shown that high efficiency of these accelerators may be reached under conditions of decreasing accelerating field along the section length in operating mode "e" times and at a possibly lesser value of waveguide load parameter (ratio of hole radius in diaphragm to oscillation wave length). Increase in power of rf generators as well as in the number of accelerating section results in the efficiency improvement.

59970 (INIS-SU—62, pp 196-198) **"Electronica" linear accelerator and its application fields.** Gryzlov, A.V.; Zakharov, M.A.; Lysov, G.V. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Application areas of the "Electronica" type electron linacs: the EhLU-4 of 4 MeV energy and 5 kW mean beam power and the EhLU-6 of 6 MeV energy and 4 kW mean beam power are enumerated. Such type accelerator is used most widely during radiation treatment of semiconductors. The application of the "Electronica" accelerators is extended in the production of radiation-modified polyethylene. Works on the accelerator application to commercial reclamation of polytetrafluorethylene are carried out. Possibility for using accelerators for radiation thermal treatment of metals is shown. Design of the EhLU-3 more compact accelerator of 2-3 MeV energy and beam power to 10 kW has been developed.

59971 (INIS-SU—62, pp 209-212) **10 cm range two-resonator electron accelerator with a bridge circuit of power supply and deep control of energy and beam current.** Bulykin, V.M.; Vikulov, V.F.; L'vov, E.I.; Milovanov, O.S.; Monakhov, V.A.; Samaryanov, Yu.A.; Smirnov, I.A.; Filatov, A.N.; Shilov, V.K.; Shkol'nikov, E.Ya. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description and nominal parameters of a resonator accelerator of vaciable energy from tens keV to 1 MeV and pulse current from units to hundreds of milliamperes for using in semiconductor defectoscopy and simulation of electrostatic shields under earth conditions are presented. An accelerating system consists of two 10 cm-wave length resonators supplied with HF power through three-decibel directional coupler. A serial autogenerator-1.3 MW pulse power magnetron is a power supply. A vacuum system contains two small zeolite pumps and the HOPD-100 electrocharge pump. An electron gun with the Trenyeva geometry producing 40 keV electron beam and 7A pulse current serves an injector. Control panel is used for distance accelerator control.

59972 (INIS-SU—62, pp 312-317) **Usage of reliability factors while designing high-voltage electron accelerators.** Al'bertinskii, B.I.; Svin'in, M.P.; Tsepakin, S.G. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Effect of reliability factors of high-voltage electron accelerato+s (IVEA) during their construction or modernization on the choice of one or another design. Solutions are considered. An expression permitting to determine a contribution of switching elements to the cost of one hour of meantime-between-failures of a high-voltage soource for the UV-25-04-2000 accelerator is given. It follows from the analysis of the results obtained that it is expedient to use KTs-20IE rectifying columns in the given accelerator. Consideration of the effect of electric field intensity in the insulation on the HVEA reliability shows that maximum intensity of the electric field is in the range of 50-70 kV/cm. Modernization of the Aurora 2 accelerator extraction windows resulted in the increase of meantime-between-failures of the facility from 32.4 386 h. It is shown that it was worth the additional expense, if the price of products fabricated equals or exceeds 1.38 rouble/kW. It is also shown that it is possible to increase technical utilization factor for the HVEA at the expense of the time reduction of the facility repair and preventive maintenance.

59973 (INIS-SU—62, pp 286-290) **Resonator electron accelerator.** Grigor'ev, A.D.; Ivanov, S.A.; Petrov, G.N.; Platonov, G.N.; Semenov, S.G. (Leningradskii Ehlektrotekhnicheskii Inst. (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A small-size HF electron accelerator containing a coaxial generator having inner spiral conductor and 30-40 voltage amplification coefficient is described. 6mm dia oxide heated cathode being under a high potential with earthed accelerator target serves as electron source. 150-200 W 1-2 MHz generator is used as a resonator power supply. Generator output voltage may be controlled in the range from 1.5 to 5 kW. The accelerator can operate both in continuous and in pulse regimes. Accelerator life-time is 100 h.

59974 (INIS-SU—62, pp 254-258) **LUEh-8 5 RV electron linac-effective source of ionizing radiation for radiation technology.** Gryzlov, A.I.; Kudinov, I.V.; Muntyan, V.I.; Prudnikov, I.A.; Rumyantsev, V.V.; Smirnov, V.L.; Susloparov, M.S.; Fomin, L.P.; Shchepin, Yu.P. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The LUEh-8-5RV electron linac of the energy range from 4 to 11 MeV for radiation treatment of plastic masses, thermal-shrinked tubes for cables and sterilization of medicine items is described. The LUEh-8-5RV represents a resonance accelerator having one accelerating waveguide supplied from magnetron. The accelerator is equipped with a beam scanner which forms the beam to a band of 0.5x0.25 cm. 5 kW maximum power of electron beam was obtained at 650 mA current. Estimations of efficiency of some systems and all the accelerator on the shole are given. According to the estimation the cost of 1 kW/MeV equals 30-40 kop. The first accelerator is exported to Hungary. Two others are intended for radiation vulcanization of ruffer items.

59975 (INIS-SU—62, pp 259-262) **Electron linac with energy recuperation of the radiation field of a relativistic beam for applied purposes.** Bogdanovich, B.Yu.; Ostanin, V.A.; Yanenko, V.V. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A possibility for using stored energy of a radiation field of bunched relativistic electron beam for its acceleration in electron linac (EL) with energy recuperation has been examined. The accelerator consists of an injector, first accelerating section, SHF power amplifier, pulse phase changer with 180 deg phase shift, driving SHF oscillator, second accelerating section which input and output are connected with feedback circuit through phase changer and form travelling wave resonator (TWR). TWR operates in storing and accelerating modes. Operating cycle of the accelerator includes energy storage beam radiation field in TWR during the main part of SHF power pulse and a period of stored energy use by 180 deg change of phase of electrons injected to TWR. As the storage and acceleration processes occur in the same decelerating structure, maximum energy of accelerator can not exceed double value of electron energy at the output of injector accelerating section.

59976 (INIS-SU—62, pp 272-277) **Some performances of the LUEh-25 as a source of mixed photon-neutron radiation.** Vainer, E.A.; Kraitor, S.N.; Kushnereva, K.K.; Filin, L.N.; Khrushchev, V.G. (Institut Biofiziki, Moscow (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Results of investigations into formation of photon-neutron radiation field on the LUEh-25 electron accelerator are given. To generate photon-neutron radiation field suitable for radiobiological investigations by neutrons it is proceeded from that that photon contri--bution into total dose must not exceed 30%, and neutron dose rate must be significantly higher. A lead cylinder of 17 cm diameter and 5 cm thickness located at the outlet of electroncanal was used as targets. Neutron spectra for 8 cm thick paraffin phantom as well as results of neutron depth dose distributions are presented. Tissue kerma rate calculated from the spectrum in the cavity of lead "house" having 10x10x10 cm dimension and 10 cm wall thickness equals 0.66-0.72 rad$\times$min$^{-1}\times$mkA^{-1} on the phantom front surface and 0.1-0.2 rad$\times$min$^{-1}\times\mu$A^{-1} on the rear surface. Neutron dose rate in air inside the cavity equals 0.13 rad$\times$min$^{-1}\times\mu$A^{-1} x/ Tissue kerma rate of neutrons ammounted to 0.6 rad$\times$min$^{-1}\times\mu$A^{-1}.

59977 (INIS-SU—62, pp 51-80) **High power DC electron accelerators for industrial applications.** Cleland, M.R.; Morganstern, K.H.; Thompson, S.S. (Radiation Dynamics, Inc., Melville, Long Island, NY (USA)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The basic design principles of a dynamitron, its major components are described and some of its unique characteristics are pointed out. The operation of a dinamitron are explained, and its capability for high beam current at maximum voltage are emphasized. At present the maximum beam current rating of the half-wave series is 50 MA for the voltage rating from 0.4 to 4 MV. It is shown that this type of accelerator is able to deliver higher voltage and higher power levels than have been available in the past and is stimulating the use of electron beam radiation on a wider variety of products.

59978 (INIS-SU—74, pp 3-10) **Status and prospects of accelerator usage for radiotherapy.** Aleksandrov, N.N.; Tarutin, I.G.; Muravskaya, G.V.; Pilyavets, V.I. (Nauchno-Issledovatel'skii Inst. Onkologii i Meditsinskoj Radiologii, Minsk (Byelorussian SSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The state of charged particle accelerators, intended for the methods of beam therapy is described. A complex of medicine-technical requirements to therapeutic electron accelerators is determined in the result of analysis of megavoltage beam therapy. Necessity of creating possibility for smooth control of eneray and tangential shift of the irradiator, application of controlling computers for wide change of beam parameters is shown. production of accurate dosimeters with the error up to 1-2% is necessary. It is shown, that modern accelerators should be produced on a new element base using integral technique and have unit structure with indication of unit faults. Modern accelerators, except beam therapy, should be used in automatized complexes for generating short-lived isotopes.

59979 (INIS-SU—74, pp 24-26) **Medicine electron linac with programming control - the LUEh-15MEh functional model.** Budtov, A.A.; Vakhrushin, Yu.P.; Gerasimov, V.P.; Prudnikov, I.A.; Rumyantsev, V.V.; Smirnov, V.L.; Chichikalov, Yu.F.; Chubinskaya-Nadezhdina, I.L.; Shakhov, V.I. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description of the LUE-15 ME medicine linac with the energy up to 20 MeV with control from 10 MeV by stages through 2.5 MeV with field dimensions of bremsstrahlung up to 35x35 cm and irradiation field with 10 Gi/min intensity and not more, than +-5% nonuniformity, is given. Emitter of the linac comprises three parts, two of them - rotating and the third one is stationary. Rotational-tangential irradiation regimes, as well as programming irradiation can be exercised in the accelerator. The accelerator is equipped with modern dosimetric apparatus made in the form of separate frame.

59980 (INIS-SU—74, pp 68-78) **Saturne accelerator with minicomputer and microprocessor.** Leboutet, H.; Bertine, J.P. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The development of the "Saturne" radiotherapy accelerator in respect with using computers is shown. The "SATURNE"-electron linac provides the operation of X-ray therapy: 18 MeV electrons or 10 MeV electrons, dose rate: 100, 200, 300, 400 Rad/min, field size: 2x2 to 40x40 cm at 1 meter, arqtherapy: 0.7 to 7 Rads/degree and electron therapy: 20, 17, 13 MeV, 9.6 MeV dose rate: 400 Rads/mn, 150 Rads/mn, field size: 2x2 to 30x30 cm, arctherapy: 0.7 to 4 Rad/degree. The "SATURNE" accelerator operates by a PDP 2 computer. The main functions of the computer: run the accelerator, run the treatment, run the records. The main program takes care of: the dialoge, display of defects and state of the system, movements and display, tasks which are specific to each place of operation. The use of the 6800 Motorola microprocessor simplifies the wiring and gives more versatile systems.

59981 (INIS-SU—74, pp 45-52) **B-32/6 betatron for medicine.** Bulaev, O.F.; Vas'kovskii, I.K.; Gorbunov, V.I.; Kozlov, V.I.; Kononov, V.A. (Tomskii Politekhnicheskii Inst. (USSR). Nauchno-Issledovatel'skii Inst. Ehlektronnoj Introskopii). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A description of B-32/6 betatron intended for beam therapy by means of electron radiation and bremsstrahlung is presented. The betatron permits to conduct both stationary and rotation irradiation. Bremsstrahlung and electron beams are extracted along one axis, that does not require to carry out alignment during transfer from one type of irradiation to another. The betatron comprises emitter, control desk, dosimetric desk, electrical equipment, capacitor system and mechanism for emitter move. The main technical characteristics of betatrons as follows: accelerated electron energy - 32 MeV, bremsstrahlung dose rate at 1 m distance from the target approximately 150 rad/min+ dose rate of electron radiation at 1 m distance from lead-out window - 200 rad/min, limits of dose field from 40x40 to 200x200 mm, the limiting deflection angle of emitter +-75%, the limiting angle of tangential turn of the emitter +-25 deg, the range of regulation of rotation angular rate eMitter -O.6-6.0 deg/s.

59982 (INIS-SU—74, pp 211-216) **Characteristics of the LUEh-8-5 accelerator beam.** Andrianov, K.N.; Astakhov, A.A.; Balitskii, V.A.; Grinev, M.P.; Vasil'eva, A.A.; Konnov, A.G.; Golubev, A.D. (Ministerstvo Zdravookhraneniya SSSR, Moscow. Inst. Biofiziki). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Measures on improvement of the LUE-8-5M accelerator are taken for most complete provision of operations on irradiation of different objects in this accelerator. A two-coordinate recorder is built-in in the system of magnetic analyzer. A tungsten target is installed for bremsstrahlung generating. A generator of rectangular pulses is used to provided operation regime with decreased frequency of pulse passing as well as operation in expectation regime of single start. Isodose distributions in normal cross section of turned beam at the distance of 40 cm from the exit foil and distribution of field intensity of bremsstrahlung at the distance of 150 cm from the target are presented. In the regime of generating of separate pulses the reproduction of integral dose constituted +-16%, at absolute value of the dose up to 2 krad/pulse at the distance of 20 cm from the exit window at 0.3 A pulse current and 8 MeV electron energy. The experience of accelerator operation is briefly described.

59983 **(LBL—14400) High-field superconducting accelerator magnets.** Taylor, C.; Meuser, R.; Caspi, S.; Gilbert, W.; Hassenzahl, W.; Peters, C.; Wolgast, R. (Lawrence Berkeley Lab., CA (USA)). May 1982. Contract AC03-76SF00098. 7p. (CONF-820546—10). NTIS, PC A02/MF A01. Order Number DE82020517.

From 9. international cyrogenic engineering conference; Kobe, Japan (10 May 1982).

The next generation of accelerators for high-energy physics will require high-field, small-bore dipole magnets: in the region of 10 T and 40-mm diam. For such magnets, there is a great incentive to attain high overall current density through increasing the current density within the superconductor and minimizing the copper stabilizer. Both Nb-Ti operating at 1.8 K and Nb_3Sn at 4.2 are candidate superconductors. Two programs in the US and one in Japan are directed toward the development of such magnets. The program at LBL is described below.

59984 **(LUNFD6/NFML—7001/1-10/(1981)) SVEACC.** Eriksson, M. (Lund Univ. (Sweden). Fysiska Institutionen). 9 Nov 1981. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82701839.

An accelerator system for accelerator-based research is currently being discussed in Sweden. A proposed accelerator system consisting of proton, light and heavy ion injectors, a cyclotron and two synchrotrons is discussed, some parameter values are proposed and a rough cost estimate for some essential parts is given.

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 60067, 60308

59985 **(BNL—51536) Study on the conditions required for the transverse stability of a coasting beam in proton storage rings.** Cornacchia, M.; Pellegrini, C. (Brookhaven National Lab., Upton, NY (USA)). Feb 1982. Contract AC02-76CH00016. 41p. NTIS, PC A03/MF A01. Order Number DE82020553.

A general theory of the transverse instability of coasting beams in circular accelerators produced by the interaction of the beam charge and current with its electromagnetic environment is presented. The theory allows to numerically calculate the threshold current for an arbitrary frequency versus momentum curve. The numerical solution is used to study the stability of a coasting beam in a high energy proton storage ring like ISABELLE during the stacking process and for a full intensity beam.

59986 **(EFI—473(16)-81) Experimental investigation of electron motion in axial-circular magnetic field.** Akopov, M.A.; Martirosyan, Yu.L.; Petrosyan, B.V.; Petrosyan, M.L. (Erevanskij Fizicheskij Inst. (USSR)). 1981. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702377.

The results are presented of the experimental check of the electron motion stability in axial-circular, constant- in-time magnetic field. A couple of quadrupole lenses was set on the ring. When switching the lenses off the value of the particle vertical drift is in good agreement with the theory. At switching them on the electron motion in the ring turns stable. During the experiment the electrons in the ring made some 60 turns. The scattering on the residual gas accounts for the finite time of the electron beam existence in the ring. The results confirm the possibility of construction of charged particle accelerators with a constant- in-time axial-circular magnetic field.

59987 **(EFI—482(25)-81) System of automized determination of charged particle trajectories in extended magnetic fields.** Toumanian, A.R. (Erevanskij Fizicheskij Inst. (USSR)). 1981. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702378.

An automized system for the determination of particle trajectories by the floating current-carrying wire method is described. The system is able to determine the charged particle trajectories with the energy above 100 MeV in magnetic systems of any configuration and with track extent up to several tens metres with momentum resolution up to 3.10^{-4}. The system efficiency makes 1500 tracks/hour on the average.

59988 **(FERMILAB/TM—1124) Collins' bypass for the main ring.** Ohnuma, S. (Fermi National Accelerator Lab., Batavia, IL (USA)). 10 Aug 1982. Contract AC02-76CH03000. 13p. NTIS, PC A02/MF A01. Order Number DE82021917.

Design of the bypass for the main ring at Fermilab is discussed. Specific design features discussed include space, path length, geometric closure, matching of betatron functions, and external dispersion. Bypass parameters are given. (GHT)

59989 **(FERMILAB/TM—1127) Tinkering at the main-ring lattice.** Ohnuma, S. (Fermi National Accelerator Lab., Batavia, IL (USA)). 23 Aug 1982. Contract AC02-76CH03000. 21p. NTIS, PC A02/MF A01. Order Number DE82021920.

To improve production of usable antiprotons using the proton beam from the main ring and the lossless injection of cooled antiprotons into the main ring, modifications of the main ring lattice are recommended.

59990 (INIS-SU—31, pp 76-70) **Calculation of the electrostatic periodic focusing system of a capacitor type in a drift tube accelerator.** Gavrilov, N.M.; Nesterovich, A.V. 1980. (In Russian). NTIS (US Sales Only).

In Accelerators. No. 19. Theory calculation experimental works on charged particles accelerators.

Focusing properties of an electrostatic periodic focusing system (EPFS) in a linac with drift tubes are evaluated. Evaluation of the EPFS properties is performed assuming that the field effect on particles is defined mainly by the first harmonics of the focusing potential. The charging time of the focusing electrode is estimated up to the focusing potential. It is shown that utilization of EPFS with electrodes located between the resonators permits to reduce the mass and dimensions of the system in comparison with the magnetic periodic focusing system.

59991 (INIS-SU—31, pp 109-114) **Peculiarities of particle phase motion in the accelerator with focusing by the guiding field.** Baev, V.K.; Kolyaskin, A.D. 1980. (In Russian). NTIS (US Sales Only).

In Accelerators. No. 19. Theory calculation experimental works on charged particles accelerators.

Ion beam dynamics in an accelerating system of a spiral type consisting of five sections and one drift section and using the phase-

alternating focusing is considered. Acceleration was performed in a standing wave field. The longitudinal accelerator acceptances for beams with zero initial divergence and different input parameters are given. The maximum values of the capture coefficients at different initial beam diameters and corresponding injection rates are shown. It is shown that local acceptances can differ approximately 2 times and in spite of the nonresonance character of particle interaction with the field their motion both in the longitudinal and transverse directions is stable.

59992 (INIS-SU—62, pp 204-208) **Experimental model of a continuous-operation electron linac.** Vovna, V.A.; Gryzlov, A.V.; Novozhilov, A.E.; Pavlovskii, V.A.; Plink, O.V.; Samaryanov, Yu.A.; Sobenin, N.P. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Results of investigations into 700 experimental model of 700 keV continuous operation electron linac designed for installations of radiation treatment of steels and alloys are given. Biperiodical decelerating system with coupling cells on axis operating in the standing wave mode was used as an accelerating structure. The accelerating structure consists of 9 accelerating cells and resonators. A total section length is 42 cm. The structure is assembled out of two type elements: "cups" representing accelerating semicells and coupling semicells made as one piece and rings-insertions of different height. It was established in consequence of tests that accelerated beam has 600 keV mean energy at 25 kW input power.

59993 (INIS-SU—74, pp 345-350) **On a possibility of measuring some characteristics of charged parpticle beams at the accelerator output.** Vajner, E.A.; Trukhanov, K.A. (Ministerstvo Zdravookhraneniya SSSR, Moscow. Inst. Biofiziki). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Possibility of determining current density by cross section of beam, angular and energy particle distributions at the outlet of accelerators by means of Vavilov-Cherenkov radiation is considered. Vavilov-Cherenkov radiation has been detected by means of the FEV-16 photomultiplier. Distribution of current density by beam cross section has been registered by means of the transfer method of beam "image" from the radiator to the mechanical or electronic television system. Measurement of angular distribution is based on using directivity parameters of Vavilov-Cherenkov radiation. A method based on using nonlinear section of beam current dependence on the refractive index of substance of radiator is suggested for obtaining energy distribution of the beam. Errors in measurements by means of the mentioned methods constitute 2-5%.

59994 (INIS-SU—74, pp 364-369) **Microtron bremsstrahlung beam energy measuring by different methods.** Kashcheev, A.M.; Kostyleva, Yu.G.; Mysev, I.P.; Oblizin, A.N.; Khazov, A.N. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Calibration results of measuring equipment installed on the microtron are presented for reduction of gradiation error of dosimetric equipment as well as for increase of calculation accuracy of quantometer sensitivity intended for measuring bremsstrahlung beam energy of electron accelerators. The measuring equipment included: calorimeter, three quantometers, copy of ionization chamber of R2 NBS type and thick-wall ionization chamber. Energy of electron beam is equal 16.2+-0.3 MeV. Diameter of the beam on the target did not exceed 3 mm. Sensitivity for thick-wall chamber constituted 0.901 μC/j+-2.2%; R2 chamber -2.385 mC/J+-2.3%, quantometers -0.533, 0.541 and 0.548 mC/J with 2.3% error. Measurements made up the basis of certification of the first domestic installation on the base of microtron permitting to reproduce and transmit dimension of beam energy unit with the error of 2.3% that is sufficient for the succeeding solution of problems of graduating dosimetric equipment in the units of beam energy, energy transfer and exposure dose.

59995 (INIS-SU—74, pp 308-312) **Measuring main beam parameters in the I-2 proton linac.** Kozodaev, A.M.; Romanovskii, R.A. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A measuring system of momentary and amplitude current values as well as pulse intensity of a proton beam of the I-2 linac for 24.6 MeV energy and 150 mA current in pulse is described. The range of measured current pulses makes up 1-100 mA, nonlinearity of the whole measuring channel equals +-2%. A multilamel current receiver gives information on distribution of particle density. Average energy of particles, width of energy spectrum of the beam and stability of these parameters are determined by means of a spectrometer comprising a shaping channel deviation magnet and registration devices. Resolution of the spectrometer is not worse than 0.12%.

59996 (INIS-SU—74, pp 322-330) **Scanned electron beam and its measuring in accelerators.** Strakovskaya, R.Yu. (AN Ukrainskoj SSR, Donetsk. Inst. Fizicheskoj Khimii). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Approximate formulas for spatial distribution of flux density of scanned electron beams are obtained. The approximation degree is chosen sufficient for purposes of practical dosimetry. Cases of multidirected and linearly scanned beams are considered. It is shown that at linear scanning of the beam the accelerator bell length should be larger than the required dimension of uniform field. It is shown that distribution of scanned electron beam is expressed by probability integral which is tabulated. It is stated that at linear scanning the length of uniform section should be less than the scanning length. Problems of scanned beam collimation are investigated. Collimation coefficient is also expressed by probability integral. The conditions, under which the radiation can be considered collimated, are found. The obtained expressions for distribution function of electron field and collimation coefficient correspond to experimental data. Comparative measurements of electron radiation dose by means of dosimetric films for non-collimated and collimated beams at different collimator depth are conducted. The obtained values of collimation coefficients have been compared with the calculation ones.

59997 (INIS-SU—74, pp 198-202) **System for measuring and monitoring beam parameters of an electron accelerator.** Protasov, A.K.; Rybin, V.M.; Tsyplyakov, A.P. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description of the system intended for measuring amplitude of pulse current, observation of the pulse shape measurement of coordinates of the centre of gravity and diameter of the beam of a heavy-current electron accelerator as well as registration of information on the digital printer is presented. The system comprises a set of converters preamplifier of the measuring channel of beam location, unit of secondary conversion. A magnetoinduction converter with a ferrite core NM-3000 with 180x110x15 mm dimensions is used in the channel of current measurement. Acoustic converter is the primary converter in the channel of measuring the location and beam diameter. Error of measuring current amplitude constitutes 8%, error of measuring beam location +-2 mm, beam diameter approximately 10-15%.

59998 (INIS-SU—74, pp 291-300) **To the problem of accuracy in monitoring of accelerated electron beam current by a Faraday cup.** Sokolov, N.I. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The problem of approaching maximal measurement accuracy of beam parameters by means of Faraday cylinder is solved for using Faraday cylinder (FC) as a standard of primary convertor

during graduation of monitors for measurement of different parameters of accelerated electron beam. The effects of vacuum conditions, reflection of electrons and secondary emission and the effect of leakage current on measurement error are considered. Choice of material for CF isolators is grounded. A formula for evaluation of CF permeability at any energy is derived.

59999 (INIS-SU—74, pp 174-179) **Choice of primary converters for measuring main parameters of extracted beams from charged particle accelerators.** Rybin, V.M. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Methods permitting to make optimal choice of primary converters for measuring parameters of charged particle beams in accelerators with account of demand made to converters and its characteristics is developed. Classification of primary converters is given by physical principle of data conversion; by the degree of effect on the beam; by the principle of operation, by design, by location. It is shown that at standardization of measurement ranges of time, electric, energy and geometric characteristics of charged particle beams the maximal number of different modifications of primary converters on introduction of unified requirements to design and technology during their production does not exceed 96 with account of their different location in the accelerators.

60000 (INIS-SU—74, pp 263-267) **Microsecond and nanosecond pulsed electron beam monitoring.** Dzhelepov, I.B.; Sirotyuk, O.S.; Safin, V.M.; Pugachev, B.N.; Terent'ev, Yu.V. (Leningradskii Tekhnologicheskii Inst. (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Investigation results of dosimetric properties of the TATs-140 industrial film on the base of cellulose triacetate are presented. Film irradiation has been conducted in "Elit-2" and "Minus" accelerators with 1.5 MeV and 400 keV electron beam 12.5 A and 5 kA been current, 3 μs and 10 ns current pulse duration respectively. It is shown that the TATs-140 film can be used as a dosimetric system for electron pulsed beams of microsecond range with $5x10^9$ rad/sec dose rate. Linearity of the absorbed dose is preserved from 3 to 100 mrad with +-10% error.

60001 (INIS-SU—74, pp 257-262) **Beam position measuring system for electron linac.** Glazkov, A.A.; Glazov, A.I.; Alekseev, L.K. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A description of measuring system of electron beam location of the U-28 linac permitting to conduct measurements within the range of beam current from 5 mA to 100 mA is presented. Flowsheet of the measuring system on the base of resonator monitors is given. A prismatic hollow resonator excited simultaneously at two types of oscillations of E_{120} and E_{210} is used as a monitor of location. Penetrating the two monitors (resonator monitor of location and resonator monitor of current), the electron beam excites electromagnetic oscillations in them, the phase difference between which serves for determination of shift direction of the centre of gravity of the beam. The measuring system is marked by simplicity production technology and safety.

60002 (INIS-SU—74, pp 244-251) **Study on parameters of ionizing radiation field from the UV-25-0,4-2000 accelerator.** Afanas'ev, M.I.; Druzgal'skii, I.V. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Measurement methods and results of field parameters of ionizing radiation of the UV-25-0.4-2000 high-voltage electron accelerator intended for radiation treatment of tissues are presented. The measuring complex comprises a set of detectors with a moving device, a panel electronic frame and a cable connection line. The following data are obtained as a result of measurements: distribution nonuniformity of linear current density along the outlet window at 150 mm distance from the foil constituted +-4.5% at the length of 1800 mm, instability of linear current density during 1 hour of the accelerator operation under nominal regime made up +-2%, energy flux at 1800 mm length under 400 kV, 75 mA regime constituted 16.5 kW.

60003 **(JINR-R—9-81-223) Study on some high-frequency properties of an electron ring in the adhezator chamber of a collective accelerator model.** Gabanets, I.; Zhabitskij, V.M.; Stepanov, A.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702380.

The frequency measurements in the range of 20-180 MHz, excited by an electron ring in the adhezator chamber of a collective accelerator model under the regime with constant field and injection system, have been carried out. At first, the measurements of rf parameters of adhezator chamber without a beam have been held. The measurements were accomplished by a loop of small dimensions screened from electric fields. The place and orientation of the loop were selected so that the magnetic field of the electron ring should have been effectively registered. The amplitude-frequency spectrum of the magnetic field of the ring was recorded by a pulsed analyzer of spectrum. Identification of the measured frequencies on the basis of the known calculations of the beam dynamics has been carried out. It allowed to determine the effective value of the magnetic field decrease index, taking into account the Coulomb shift of the frequencies and the radius of equilibrium orbit of the formed electron ring.

60004 **(JINR-R—9-81-245) Methods of investigating electron rings by synchrotron radiation.** Golutvin, I.A.; Mal'tsev, A.A.; Sarantsev, V.P.; Sviridov, V.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1981. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702381.

The results of investigating electron rings by the synchrotron radiation in IR-region of spectrum are presented. Some results of measuring such characteristics of electron ring as its geometrical dimensions, compression dynamics, electron number in ring bunch are given.

60005 **Integrability of the two-dimensional beam-beam interaction in a special case.** Ruggiero, A.G. (Fermi National Accelerator Lab., Batavia, IL (USA)). *Particle Accelerators;* **12**: No. 1, 45-47(Mar 1982).

It is shown that with the assumption of zero chromaticity, zero dispersion and symmetry between x and y, head-on collisions of bunched beams produce a beam-beam interaction that can be reduced to a one-dimensional weak-strong interaction. The KAM theorem ensures that for small values of the strong beam, the motion is bounded by stable trajectories. There can therefore be no Arnol'd diffusion in these circumstances.

60006 (IPNO—81-05, pp 119-127) **Electron beam focusing and thermal effects.** Foegen, B. (Frankfurt Univ. (Germany, F.R.)). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Limitations of electron beam densities by electromagnetic compressions are given involving thermal effects, particularly with an extension of the Pierce-Walker theory.

60007 (IPNO—81-05, pp 164-169) **Limiting current densities in ion compensated Brillouin focused electron beams.** Becker, R. (Frankfurt Univ. (Germany, F.R.). Inst. fuer Angewandte Physik). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Limitations of electron beam "collapses" are shown due to thermal and residual magnetic cathode flux. Comparison with the CRYEBIS results are made.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 60076, 60308

60008 **(BNL—31427) H5 fast-kicker-magnet pulser.** Frey, W.; Ghoshroy, S.; Cottingham, J.G. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 6p. (CONF-820626—10). NTIS, PC A02/MF A01. Order Number DE82020002.

From 15. power modulator symposium; Baltimore, MD, USA (14 Jun 1982).

Portions of document are illegible.

The fast extraction kicker magnet for the AGS is powered by a novel pulse generator. A pulse forming network (PFN) is discharged into nearly 100% mismatched load. The pulser delivers a current pulse of 3000 amperes peak pulse with a 2% flat-top ripple into a 1.4 μ H single turn ferrite core magnet. The pulse is 2.8 μsec wide with a 180 nsec rise time, at a 0.5 to 1.5 pps repetition rate. The pulse rise time is required to provide clean extraction of the 28 GeV proton beam by bringing the kicker magnet field up to 1.25 kG within the 220 nsec space between proton bunches in the machine. The pulser is mounted adjacent to the kicker magnet in the AGS ring. The thyratron's characteristics are not affected by the ionizing radiation environment during operation of the AGS (Alternating Gradient Synchrotron).

60009 **(EFI—460(2)-81) Some schemes for two-channel simultaneous extraction of gamma rays.** Zapol'skij, N.A.; Kovalenko, V.I.; Markar'yan, A.A.; Nikogosyan, V.Ts.; Simonyan, Kh.A.; Tumanyan, A.R. (Erevanskij Fizicheskij Inst. (USSR)). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702376.

Some circuits of magnetic field perturbation of FOFDOD type synchrotron for simultaneous, in each acceleration cycle, guidance of circulating beam onto two targets in neighbouring focusing straight sections of the accelerator are described. The circuits, developed for various working regimes of the ejection channels of the synchrotron secondary beams, are distinguished by relatively low consumption of electrical power and convenient operational characteristics.

60010 **(EFI—475(18)-81) Magnetic fields of helical ondulators.** Oganesyan, K.B.; Petrosyan, M.L. (Erevanskij Fizicheskij Inst. (USSR)). 1981. 22p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702365.

Results of the magnetic field distribution calculations in real spiral ondulators as well as recommendations for the choice of the ondulator basic parameters as following from the radiation source physical requirements are given.

60011 **(EFI—491(34)-81) Influence of the magnetic field of polarized proton target on charged particle trajectories.** Kazaryan, A.P.; Manukyan, Zh.V.; Sirunyan, A.M. (Erevanskij Fizicheskij Inst. (USSR)). 1981. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702412.

The calculation is done of the magnetic system of polarized proton target (PPT) using the method of breaking up solenoids into thin radial layers. It is shown that at the number of layers M=70 the field calculation accuracy is no worse than 10^{-4}. The charged particle trajectories are calculated in experiments with PPT and the influence of its field is investigated on the magnetic spectrometer adjusting parameters. Dependences of correction values for the momenta of tracing particles in the interval 200-1600 MeV/c are given. The simulation of experiments with PPT and magnetic spectrometer with the Monte-Carlo method is carried on and the possibility of the calculation program optimization is shown. The influence of the PPT magnetic field on the spectrometer resolution and transmission is studied. The results obtained are necessary to carry on experiments with polarized proton targets.

60012 (INIS-mf—7123, pp v) **Current status of the design of a tritium target for the Saclay 700 MeV LINAC.** Cavedon, J.M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Div. de la Physique). 1981. Dep. NTIS (US Sales Only).

From Conference on the study of few body systems with electromagnetic probes; Amsterdam, Netherlands (19 Nov 1981).

The author reports briefly on a liquid tritium target that is being designed at Saclay. The primary aim is to determine the magnetic form factor of ^3H up to $q^2 = 30$ fm^{-2}. For the target, the amount of tritium in the system is limited to one gram, i.e. an activity of 10 kCi. The target is being designed exclusively for single-arm electron scattering experiments, with reasonable beam intensities (10 to 30 μA) and scattering angles between 25 and 155 degrees. This should allow to measure the elastic, inelastic and deep inelastic scattering of electrons, including the 2 and 3-body break-up if a sufficient energy resolution can be achieved. The limited amount of tritium available forces one to work with a well collimated beam: the target cylinder has a diameter of 10 mm. (Auth.).

60013 (INIS-SU—62, pp 179-185) **Prospects for application of induction linear accelerators in the national economy.** Vakhrushin, Yu.P.; Gagen-Torn, V.K.; Gusev, O.A.; Kuznetsov, V.S. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Expedience of utilization of kA induction electron linacs (IEL) for sewage treatment, steel hardeninq, construction of tunnels in rocks is shown. Design of commercial IEL is being developed. The accelerator consists of 0.25 MeV separate accelerating modules mean beam power equals 1.25 MeV at a mean power of 200 kW. A multibeam electron-optical system is suggested to improve conditions of extraction foil cooling. Kilowattxhour cost according to oriented estimates will approximately amount to 10 kop during the similar accelerator operation.

60014 (INIS-SU—62, pp 186-195) **Standing wave electron linac with a bridge circuit of power supply for defectoscopy and medicine.** Vikulov, V.F.; Zverev, B.V.; Zavadtsev, A.A.; Kalyuzhnyi, V.E.; Kaminskii, V.I.; Li, E.A.; Nechaev, N.N.; Sobenin, N.P. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Experimental investigation of three electron linacs distinguished both with HF power supply and accelerating resonators was carried on to optimize biperiodical decelerating systems and HF power supply. Results of tests of three-sectional electron linac consisting of 3 accelerating buncher cells and 7 accelerating cells and 6 coupling cells of 85 cm accelerating section are given. 5.2 MeV mean energy at 10 mA beam current was generated during tests of the accelerator of 1.2 MW input power. Output beam radius did not exceed 2 mm. Prospects of usage of standing wave electron linacs in national economy are shown.

60015 (INIS-SU—62, pp 199-203) **Electron linac for pulsed radiolysis.** Gryzlov, A.V. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description and results of investigations into the 8 MeV EhLU-6 electron linac for scientific researches in the radiation technology are given. A microsecond pulse modulator is made according to a circuit with a partial charge of capacity. Nanosecond pulses are generated by another magnetothyristor modulator with ferrite shaping line. Accelerating system operates in the steady state regime and in the storage mode. Given are dependences of accelerator current on injection voltage as well as loading characteristics in the storage regime. According to calculations the formation of one bunch of electrons will permit to generate 5 ns current pulses with an umplitude not less than 100 A.

60016 (INIS-SU—62, pp 213-217) **Technological set of cyclotrons for applied purposes.** Vakhrushin, Yu.P.; Vorogushin, M.F.; Malyshev, I.F.; Stepanov, A.V. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Technological set of cyclotrons designed for usage in national economy and medicine, have been considered to decrease costs of designing, equipment fabrication, construction of buildings as well as operational costs. The ATs type cyclotron of $12Z^2/A$ MeV energy and beam current of up to 100 μA designed for production of short-lived radioactive gases as well as for purposes of activation analysis pertains to the first type of this set. 103 cm MBTs cyclotron for acceleration of protons, deuterons, two-charge ions of helium-3 and helium-4 in the energy range from 5 to 20 Z^2/A MeV pertains to the second type. This cyclotron is intended for the production of radionuclides used in medical diagnostics. RITS radioisotope cyclotron of proton energy to 28 MeV at intensity to 1500 μA an the internal target and to 200μA at on the enternal target pertains to the third type. The MMTs and the KTs cyclotrons of 670 and 220 MeV output energy designed for the commercial production of ^{57}Co and ^{109}Cd pertain to the fourth type.

60017 (INIS-SU—62, pp 218-224) **MGZh cyclotron for Aabo Academy and its operation.** Stepanov, A.V.; Bogdanov, P.V.; Gal'chuk, A.V.; Krymov, E.B. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Operational experience of a sector-focusing cyclotron with variable energy from 5 to 20 Z^2/A MeV made for the Aabo Academy (Finland) and indended for acceleration of protons, deuterons, helium-3 and helium-4 ions is described. The cyclotron is operated with qualified service personnel of two persons in one shift and mean operating time amounts to 100h in a month. Time necessary for cyclotron preparation for operation and start-up is 20-30 min. Cyclotron maintenance is carried out twice a year, maintenance time is 2-3 weeks. Typical regimes and operating time of the accelerator are given for 4 months in 1978. Nuclear-physical experiments are carried out on the cyclotron, besides it is used for the production of C^{11}, O^{15}, F^{18}, Rb^{81} isotopes.

60018 (INIS-SU—62, pp 291-294) **Beam current control system for a high-voltage accelerator.** Razin, G.I.; Val'tman, D.S.; Timofeev, V.E. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A flowsheet of the beam current control system for commercial accelerators is given. Setting and stabilization of a given beam current value are accomplished by the automatic change of a current of a diode electron gun heater or potential of a qrid of three-electrode gun. Beam current coming to an electron-optical converter generates a control signal supplying electron gun. The system operates in the beam current stabilization regime as well as in the radiation dose stabilization regime. The system response amounts to $<= 15$ s. Beam is transferred by a field of deflecting plates.

60019 (INIS-SU—62, pp 295-302) **Some problems of designing extraction windows for industrial high-voltage electron accelerators.** Nikishkin, V.I. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Basic problems arising during the analysis of mathematical models of various construction extraction windows have been considered to increase the reliability extraction windows for industrial high-voltage accelerators. Examined were extraction windows where foil is cooled at the expense of thermal conductivity effect as well as extraction windows where foil is cooled by the convection method. The analysis of basic thermal-physical processes in the extraction windows demonstrates that in most cases the calculation of foil temperature is reduced to the solution of a boundary problem for a common differential equation or to the solution of a two-dimensional boundary problem for an elliptical type equation. Conclusions have been drawn that increase in air velocity is not desirable for two reasons: foil load increases and compressor power is required to enhance.

60020 (INIS-SU—62, pp 225-227) **Small-sized betatrons with controlled frequency of radiation pulses and their application.** Bojko, D.A.; Burov, G.I.; Mynko, A.A.; Pushin, V.S.; Romanov, V.V.; Filimonov, A.A.; Chakhlov, V.L.; Chakhlov, G.L.; Shtejn, M.M. (Tomskii Politekhnicheskii Inst. (USSR). Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The MIB-3 and the MIB-6 small-sized betatrons of 3 and 6 MeV correspondingly with pulse power supply have been designed to increase bremsstrahlung exposure dose rate. Basic technical characteristics of the betatrons for defectoscopy of different materials under nonstationary conditions are given. In these betatrons the energy variation is performed with the help of magnetic flux. Betatron tests have shown that gap measurement accuracy in conjugations of crank and connecting-rod assembly for 30-200 mm internal combustion engine case thickness constitutes 0.1-0.2 mm when using the radiographic method and 15-25 μm when using the radiometric method.

60021 (INIS-SU—62, pp 238-245) **Prospects of development of accelerators for applied purposes on the basis of patent information analysis.** Dmitriev, S.P.; Prudnikov, I.A.; Fedotov, M.T. (Nauchno-Issledovatel'skii Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)); Petrov, I.I. (Vsesoyuznyi Nauchno-Issledovatel'skii Inst. Gosudarstvennoj Patentnoj Ehkspertizy, (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A technique for investigations of trends of commercial accelerator development is described. The technique is intended determining the nature of change of the dynamics criterium of trends of development (type of accelerator) and obtaining its mean value from the equation of curvilinear one-parametric regression. The technique developed was tested in the process of analysis of 2000 inventions related to charged particle accelerators. The first stage of calculations is based on the analysis of retrospective data fund and analysis of the data on introduced engineering solutions. The second stage is based on the analysis of physical-technical characteristics of compared objects. Mean period of invention introduction in accelerating technique (12-15 years) has been determined and correctness of estimation from the retrospective fund of inventions and modern data on introduced accelerators has been checked. The checking revealed the correspondence of accelerator distribution in a value of dynamics criterium.

60022 (INIS-SU—62, pp 263-271) **3 cm cryogenic electron linac for defectoscopy and medicine.** Androsov, V.V.; Saverskii, A.Ya.; Shchedrin, I.S. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Comparative estimations of basic HF parameters of travelling and standing wave accelerating structures of cryogenic variants are given. A possibility for using liquid nitrogen as coolant has been considered. Changes in energy attenuation and storage along 1 m length for circular corrugated wavequide (CCW) when changing copper temperature from room to liquid nitrogen temperature has been considered as well. It is shown that nitrogen cooling does not result in significant energy gain for travelling wave CCW, however considerably decreases a share of power for attenuation in walls: electron efficiency of the accelerator may be increased at the expense of this share of power conserving energy storage a t the same level. Examination of the accelerating structure in the standing wave regime has shown that it is possible to gain considerably with respect to the field in comparison with 70 cm wave length when cooling 3 cm-wave length section with liquid nitrogen. At that, time of filling of the accelerating cell with accelerating field reduces almost 3 times as compared to a "hot" 10 cm version. It is

shown that liquid nitrogen consumption will amount not more than 2l/h for cooling of 1 m long 3 cm accelerating structure.

60023 (INIS-SU—62, pp 236-237) **Program-adapted system for control of accelerators for national economy.** Bagrievich, V.P.; Komarov, A.I.; Petrunin, V.I.; Stepanov, G.V.; Chernyakov, G.I. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

To unify control, interlocking and signalling systems (CIS) for accelerators of applied purposes results of CIS tests and checking of its algorithmic principles are given. A logic unit of CIS is made on the base of a specialized computing system. Control of accelerator systems were carried out on a special small-sized panel in the form of monocircuit. Realized apparatus part and fast response of controlling device have determined the following restrictions in a volume of processed data: quantity of binary data transducers-128, quantity of binary executive elements-32, quantity of program commands in mass memory-600, mean time of data processingf - 2s.

60024 (INIS-SU—62, pp 85-90) **Radiation processing complex on the basis of high-current electron linacs for radiation investigations and activation analysis.** Muntyan, V.I.; Prudnikov, I.A.; Shakhov, V.I. (Nauchno-Issledovatel'skii Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)); Burmistenko, Yu.N.; Vanyushkin, B.M.; Garnyk, D.V.; Kon'kov, N.G.; Feoktistov, Yu.V. (Vsesoyuznyj Nauchno-Issledovatel'skii Inst. Radiatsionnoj Tekhniki, Moscow (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A complex for designing and implementation of methods and facilities for radiation technology constructed on the basis of the LUEh-8-5M and the LUEh-22A high-current electron linacs of the energy of 4-12 MeV and 8-40 MeV, accordingly, and 700 μA mean beam current is described. The LUEh-8-5M is equipped with a beam bending system and beam scanning system permitting to irradiate specimens moved on a conveyer. The LUEh-22A has a neutron converter with a moderator unit permitting to produce neutron fluxes of up to 10^{14} neutr./s. A number of applied investigations have been carried on by means of the complex including a number of studies on development of activation analysis technique using the reaction of gamma quanta inelastic scattering as well as studies on the analysis of specimen complex composition have been carried out.

60025 (INIS-SU—62, pp 148-156) **"Alin-10" electron linac for medicine.** Bachu, G.; Behltsehtsyan, N.; Leshtary, M. (Institutul Central de Fizica, Bucharest (Romania)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The Alin-10 17 MeV electron linac designed for the rapeutic treatment of cancer and radiation technology is described. An accelerating system is 250 cm long and is equipped with a deflector permitting a beam to make pendular motion around the accelerator axis and to deflect the beam at 90 deg. Maximum pulse current equals 100 mA. At a distance of 1 m from a target the accelerator radiation equals 1500 R/min when operating with bremsstrahlung at 100 Hz frequency. Accelerator components are described and their characteristics are given. Irradiation head consists of the following elements: 1mm thick gold conversion target, movable and stationary collimators, monitor with ionization chamber, optical system for modelling real configuration of irradiation filter for producing homogeneous beam distribution over the irradiation field area.

60026 (INIS-SU—62, pp 228-235) **Ion accelerator for 14 MeV neutron high-intensive flux production.** Voronin, G.G.; Morozov, A.V.; Solnyshkov, A.I.; Tarvid, G.V. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Results of development and investigation of a neutron generator of (1-2)10^{12}ns^{-1} neutron yield having rotating targets intended for the solution of problems of controlled thermonuclear fusion are given. The neutron generator represents 150 kV compact accelerating facility of enclosed type of 20 mA ion beam current operating in a continuous regime. The target device is intended for operation together with 100 and 200 mm diameter targets having a substrate of spheric shape and active layer on the substrate in the form of ring. The target device permits rotating the targets with a velocity of up to 1200 rev. per min^{-1} at a lifetime of vacuum sealing to 1000 h. Vacuum sealing is madef F4K15M5 fluorine compound and a polished stainless steel bushing. Investigations of target temperature regime have shown that the target device and cooling system provide the normal thermal regime of neutron generator target at 3-5 kW cm^{-2} beam power.

60027 (INIS-SU—62, pp 246-253) **Specific features of the design of a cyclotron for radioisotope production.** Akulova, N.V.; Bogdanov, P.V.; Ivanov, V.V. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Results of development of an isochronous cyclotron for commercial production of Co^{57} and Ga^{67} isotopes are described. The accelerator is intended for proton acceleration up to 25 MeV at 1000-1500 mA intensity of inner beam and 200 mA intensity of external beam. An axial ion source with a hot cathode will be used in the cyclotron. Outer diameter of armour type electromagnet is 3130 mm, mass - 75 t, diameter of poles-150 cm and mean induction of magnetic field in a working gap amounts to 12 kgs. Accelerating chamber vessel is made of steel in the form of thick-wall hollow cylinder having 3130 mm outer diameter, 330 mm thickness and 380 mm height. Resonance system represents a quarter-wave line operating on 16.6 MHZ-frequency. Vacuum system is designed to produce and maintain residual pressure of $6.7x10^{-4}$ Pa and $2.7x10^{-3}$ Pa in the accelerating chamber which can be provided with two NDM-2 ion-getter pumps with an arc evaporator. The suggested constructive solution for electromagnet, accelerating chamber of the cyclotron and pumping system permitted to arrange the accelerator on the whole and to considerably decrease the level of ionizing radiations inside the chamber.

60028 (INIS-SU—74, pp 127-133) **Computer dosimetric planning of radiation treatment with the bremsstrahlung beams from the LUEh-25 for complicated configuration fields.** Afanas'ev, B.P.; Bazhanov, E.B.; Rotenberg, M.Z. (Akademiya Meditsinskikh Nauk SSSR, Leningrad. Inst. Onkologii). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Experimental measurement of axial distributions of the absorbed dose and dose in the plane perpendicular to the beam axis for the beams of bremsstrahlung of 27.5 MeV energy generated by the LUE-25 electron linac is conducted for developing calculation program of dose distributions in the range of megavoltage bremsstrahlung with 40x40 cm fields of complex configuration. The range of the investigated radiation fields was within the limits from 2x4 cm to 50x50 cm. Measurements were conducted in the aqueous phantom. The following notions were introduced at boundary energies of approximately 30 MeV for description of characteristic of primary and scattering radiations: tissue-phantom ratio and scattering-phantom ratio. This information was used in the developed program during calculating scattering functions. Bremsstrahlung is shown to produce a more favourable dose distribution in the patient body than other types of radiation by means of this program for some clinical and anatomic conditions.

60029 (INIS-SU—74, pp 134-138) **Units for measuring radiation parameters of a medicine linac.** Davydov, V.N.; Budtov, A.A.; Kuptsov, E.M.; Petrov, V.M.; Pereskokov, Yu.M.; Chubinskaya, I.L.; Shvedchikov, I.P. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A unified complex of equipment permitting a wide range program of measurements during accelerator alignment to execute operative control over the parameters during its operation and to conduct special measurements for mastering methods and planning treatment is developed on the base of operation experience of medi-

cine linacs. The units is subdivided into three groups: indicator of intensity distribution, sample dosimeter, system of measuring distribution of the absorbed dose. The whole complex of units excluding sample dosimeter is located in the system on the technological panel of the accelerator.

60030 (INIS-SU—74, pp 139-145) **Possibility of using superfast neutrons for radiotherapy on the basis of high-current proton accelerators.** Obaturov, G.M.; Kapchigashev, S.P. (Akademiya Meditsinskikh Nauk SSSR, Obninsk. Nauchno-Issledovatel'skii Inst. Meditsinskoj Radiologii). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Calculation data on depth distribution of full absorbed dose and its components for the case of normal neutron drop with 60 MeV and 200 MeV energies on half-infinite tissue-equivalent medium of 30 cm thickness are given. Relations of absorbed doses at the tissue depth of 10-15 cm to the dose on the surface, as well as data on average values of the linear energy transfers for neutrons of different energies are presented. It is shown that from the view point of therapy of deep-laying tumours the superfast neutrons are more advantageous as compared not only to rare ionizing irradiation, but to fast neutrons (14-20 MeV), which are considered perspective in modern therapy, as well. It is shown, that heavy-current accelerator of protons of "meson factory" type can be used as the neutron source with the energies up to 160 MeV with intensities enough for beam therapy. Be, Li, Al, Cu can be used as a target for production of superfast neutrons. Calculations have shown, that at the distance of 5 m from the target at 100 μA current of 70 MeV protons the dose rate can constitute 25-36 rad/min.

60031 (INIS-SU—74, pp 146-150) **Possibility of using the RITS cyclotron modification in medicine.** Obaturov, G.M.; Ermakov, V.I.; Kapchigashev, S.P. (Akademiya Meditsinskikh Nauk SSSR, Obninsk. Nauchno-Issledovatel'skii Inst. Meditsinskoj Radiologii). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Production of different short-lived isotopes, such as C^{11}, N^{13}, O^{15}, F^{18}, K^{43}, Sr^{87}, I^{123} is shown to be possible on a modified the RITs cyclotron for using fast neutrons in beam therapy. Kinematic block diagram of the neutron head is presented. The neutron head rotates relatively to the table for a patient from the vertical (the beam goes downward) along the arc in +-120 deg. The patient is inside the arc of head rotation. In the neutron head a device for formation of figured fields with the size from 2x2 up to 40x40 cm, as well as a device, permitting to imitate neutron beam at the inlet and outlet of the patient, are presupposed.

60032 (INIS-SU—74, pp 27-30) **Physical, technical and dosimetric parameters of the LUEh-15M medical electron linac.** Vakhrushin, Yu.P.; Pereskokov, Yu.M.; Prudnikov, I.A.; Chubinskaya-Nadezhdina, I.L.; Chichikalov, Yu.F.; Shvedchikov, I.P. (Nauchno-Issledovatel'skii Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)); Ermakov, I.A.; Zlobin, L.I.; Sinitsyn, R.V.; Shtukovskii, O.A. (Tsentral'nyi Nauchno-Issledovatel'skii Rentgeno-Radiologicheskii Inst., Leningrad (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description and test results of the LUE-15M medical electron linear accelerator with 15 MeV energy at the dose rate, not less, than 3 Gi/min with 30x30cm dimensions of irradiation fields and 6+-7% nonuniformity of intensity of bremsstrahlung distribution, are presented. A device, providing rotation of irradiation beams within +-120 deg range and +-14 deg tangential inclination is installed in the accelerator. Tests and control of radiation parameters of the accelerator have shown, that in the whole the accelerator corresponds to medical-technical requirements, claimed to modern medicine accelerators.

60033 (INIS-SU—74, pp 96-120) **Use of a 103-cm isochronous cyclotron in medicine.** Brenner, M.; Vauramo, E. (Turku Univ. (Finland). Inst. of Physics). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The experience during the 4 years of use of the 103 cm isochronous cyclotron of the Department of Physics of Abo Akademi, is reported. The following topics are discussed. The necessary energies and other properties of the beam for the production of ^{11}C, ^{15}O, sup(81m)Kr and other useful medical radioisotope products, target techniques, transport of the radioisotopes to application laboratories at some distance from the cyclotron, the medical applicator of the radioisotopes ^{11}C, ^{13}N and ^{15}O and the required equipment for medical investigation e.g. devices for emission-tomography and the application of the cyclotron in elemental analysis of biological specimens are presented.

60034 (INIS-SU—74, pp 79-91) **Cyclotrons for neutrontherapy.** Leboutet, H.; Bertin, J.P. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Practical problem involved in the construction of a therapy unit on the base of a cyclotron with deuteron beam are underlined. It is shown that in order to choose the best solution, one has to consider the next parameters: penetration depth, yield in Rads per kW of deuteron beam on the target, dimension, cost and power consumption of the cyclotron, dimension and feasibility of the rotating head, difficulty of target fabrication and life time of the target. The best compromise seems to be protons on beryllium at 48-50 MeV deuteron at 2 kW power on the target, with 5 cm polyethylene filter. It is shown that the best could be tungsten as a shielding material. The best solution for the collimator construction will be a movable jaws collimator.

60035 (INIS-SU—74, pp 163-173) **Neutrons from medical electron accelerators.** Swanson, W.P.; McCall, R.C. (Stanford Linear Accelerator Center, CA (USA); Stanford Univ., CA (USA)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

The significant sources of photoneutrons within a linear-accelerator treatment head are identified and absolute estimates of neutron production per treatment dose are given for optical typical components. Measured data obtained at a variety of accelerator installations are presented and compared with these calculations. Calculations show that the neutron fluence is nearly unaffected by transport in the high-Z shielding contained in standard treatment units. On the other hand, the same calculations show that the neutron spectrum is softened significantly by transport by the high-Z material. It is submitted an absolute prediction of the ratio of maximum neutron fluence (at 1 m) to the useful photon dose at the same distance. This ratio rises to an approximately constant value of 2.1×10^5 neutrons cm^{-2} rad^{-1} at incident electron energies above 25 MeV. Calculations of absolute depth-dose distributions for realistic neutron spectra in H_2O phantoms showed a rapid falloff with depth.

60036 (INIS-SU—74, pp 224-226) **LUEh 13/9 electron linac and its use for material radiation treatment in Poland.** Vintsel, Kh.; Zimek, Z. (Institute of Nuclear Research, Warsaw (Poland)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Experience of operation during 8 years of LUE-13/9 linac intended for conducting research works, development of radiation-chemical technologies as well as for irradiation of different materials in semicommercial scale is described. Data on failures of some accelerator units are presented. Accidental time constituted 8%. Conduction of regulatory and prophylactic works once a week is presupposed during the accelerator operation. Once a year the accelerator is stopped for three weeks for examination and maintenance.

60037 (INIS-SU—74, pp 217-223) **Study on neutron flux stability and distribution on metal-tritium targets of the NG-150 type industrial neutron generator.** Pronman, I.M.; Makarov, S.A.; Kazantsev, A.M.; Volkov, V.P. (Gosudarstvennyi Nauchno-Issledovatel'skii i Proektnyj Inst. Redkometallicheskoj Promyshlennosti, Moscow (USSR)). 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Experimental results on distribution of neutron flux density on the irradiated sample and on study of neutron flux stabilization on metal-tritium targets in the NG-150 neutron generator are presented. The experiments have been conducted at 150 kV accelerating voltage and 2.5 mA current of accelerated ion beam. Targets with 28.5 mm diameter and an active layer prepared of erbium, gadolinium, holmium, dysprosium tritides with substrates made of molybdenum plates 0.3 mm thick have been used. Cooling liquids: water, liquid nitrogen, mercury, freo have been used for stabilization of neutron fluxes. Comparison of copper and molybdenum substrates has shown that the target with copper substrate has a more stable characteristic of neutron yield. Additional feeding the target with tritium has resulted in keeping the neutron flux at the level of $5\text{-}7 \times 10^{10}$ neutr/s and prolongation of the target life time. The given investigations have permitted to choose optimal regimes of generator operation for conducting activation analysis of different materials as well as to evaluate application of stationary metal-tritium targets for obtaining stable neutron fluxes during a long period of time.

60038 (INIS-SU—74, pp 31-37) **Electron beam shaping by a system of foil scatteres on the LUEh-25 electron linac.** Bazhanov, E.B.; Zabrodin, B.V.; Kozlov, A.P.; Regel, A.V.; Fedosove, A.V.; Shishov, V.A. (Akademiya Meditsinskikh Nauk SSSR, Moscow. Inst. Onkologii). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Methods of formation of large fields of bremsstrahlung on the LUE-25 linear accelerator of electrons with 25 MeV energy, intended for beam therapy, is suggested. The problem of large field formation was solved by introducing an additional system of foils-filters. After the output from the vacuum accelerator chamber the electron beam is scattered on the foil and is partially limited by the collimator and two diaphragms. The central part of the electron flux passes through foil-compensator. Usage of 0.75 mm scattering foil of lead and 0.06 mm compensator of tin, located at the distance of 15 cm from each other, is shown to provide electron field with the diameter up to 56 cm at +-7% nonuniformity.

60039 (INIS-SU—74, pp 351-356) **System for uniform radiation field formation in electron linacs for study on fast processes.** Vinogradov, K.A. (Moskovskii Inzhenerno-Fizicheskii Inst. (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description of two systems of shaping radiation electron fields of linacs intended for investigations in the range of pulse radiolysis and study of short-lived radiation defects in semiconductors is presented. The first shaping system comprises pulse magnet in combination with sector magnets with opposite-directed constant fields which form the system of parallel beam transfer (SPTB) with variable geometry. The system is intended for obtaining radiation fields with 300x50 mm maximal sizes for electron energy within 1-10 MeV range. SPTB length along the beam is 35 cm, radius of particle rotation in a pulsed magnet is 16 cm, in the constant - 14.5 cm and field in gaps 0.21 T and 0.23 T respectively. The coefficient of using SPTB beam is equal to 85%. SPTB permits to investigate processes with time up to 10^{-7} s. A statistic shaping system is developed for investigating faster processes, when interacting with the system of scatterers and reflecting screen the accelerator beam increases up to 50 mm in diameter and it acquires uniforms distribution of current density by cross section. The beam shaped in this way is transformed by a doublet of magnetic quadrupolar lenses 3 up to the required dimensions. The statistic shaped system has coefficient of beam use 60% and distortion of beam isochronism in the target plane is proportional to the square of dose field dimension and for 30 cm it is equal to 10^{-9} s.

60040 (INIS-SU—74, pp 301-307) **Monitoring of parameters of ionizing radiation field of an electron accelerator with a scanned beam.** Afanas'ev, M.I. 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A mockup of a monitor of field parameters of ionizing radiation of an industrial electron accelerator with scanned beam is produced on the base of using liminescence of ionized air for measuring beam current in pulsed electron accelerators within 2-4 MeV and 20-1400 MeV energy ranges. A photoelectron multiplier PEU-68 with 50 μA permissible anode current is used as a light-sensitive element. The electric flow sheet of the monitor and test results in the "Electron-3M" accelerator are presented. The summary error of the monitor equals +-5%.

60041 (INIS-SU—74, pp 331-336) **Calculational optimization of bremsstrahlung targets taking account of beam-sample geometry.** Astakhov, A.A.; Balitskii, V.A. (Ministerstvo Zdravookhraneniya SSSR, Moscow. Inst. Biofiziki). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

An attempt is made to determine thickness of a target providing maximal yield of quanta with the eneray E>E sub(thr.), where Esub(thr) - threshold energy of nuclear reaction in electron linacs with 25-30 MeV energy intended for activation analysis. Optimization by atomic number of filter absorbing electrons passed through bremsstrahlung taraet has been conducted, the filter thickness has been chosen equal to electron path in the filter material with the energy equal to average energy of electrons that have come off the target. Copper filters provide the highest yield giving 6% advantage as compared with heavy-atomic filters and almost 40% as compared with carbon.

60042 (INIS-SU—74, pp 337-344) **Application of an acoustic monitor for determination of electron beam position and current.** Balitskii, V.A.; Filin, L.N. (Ministerstvo Zdravookhraneniya SSSR, Moscow. Inst. Biofiziki). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Ultrasonic vibrations in targets of a plate of 1 cm width and from 0.1 to 1.0 cm thickness as well as cylindrical rods with 0.3-0.5 cm diameter made of Al, Cu, Pb, Sn, Fe, W, Si are investigated for studying form distortion of accoustic pulse. Measurements have been conducted in a linear electron accelerator with 12 MeV energy. It is advisable to produce targets in the form of waveguides-thin rods and plates. Investigation results of amplitude and shape of acoustic pulse excited of the piezotransformer surface are presented. Possibility of determining beam coordinate by means of an acoustic monitor comprising a target (Al)-plate with piezotransformers on its opposite ends is tested experimentally. Determination of the second coordinate is specified by shifting of this monitor along the other coordinate by mechanical shift.

60043 (INIS-SU—74, pp 180-187) **Systems for control and measuring parameters of beams from radiation-chemical installations with electron accelerators.** Dmioktrov, G.P.; Matyukov, M.D.; Solov, A.S.; Titova, T.S.; Vinogradskii, P.S.; Samsonova, T.K. (Nauchno-Issledovatel'skii Fiziko-Khimicheskii Inst., Moscow (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description of systems intended for measurement and control of the main parameters of heavy-current electron beams (HEB) of radiation-chemical plants is presented. An equivalent electric flowsheet of a device with graphite collector permiting to measure current density of HEB with the error of not more than +-5% is considered. A description of the measuring system of beam parameters of scanning HEB is presented, where graphite collectors with corrugating surface cooled by running water serve as sensors of full current. A scale with magnetoinduction converter is developed for measurement of pulse HEB parameters.

60044 (INIS-SU—74, pp 188-197) **Status and prospects of development of methods and instruments for radiation measuring on installations with electron accelerators.** Dmitrov, G.P.; Gochaliev, G.Z.; Kozlov, Yu.D. (Nauchno-Issledovatel'skii Fiziko-Khimicheskii Inst., Moscow (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Most perspective methods and monitor for measuring parameters of heavy-current electron (HEB) beams: full current, current density, kinetic energy, beam rating, absorbed dose and dose rate are enumerated for further intensification of radiation-chemical plants with heavy-current electron accelerators. Necessity of producing polymeric dosimeters as well as development of methods and means of dosimeter graduation are shown. It is also shown that control methods of HEB parameters and monitoring devices are developed in three directions: perfection of shadow methods based on detection of a part of the beam by current conducting sounds, development of new contactless methods as compared with Rogovskii belt as well as search of new radiation-resistant fluorescent screens.

60045 (INIS-SU—74, pp 287-290) **Calculating electron linac target heating.** Prudnikov, I.A.; Tronov, B.N. (Nauchno-Issledovatel'skii Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)); Ivanov, S.A.; Nazarov, I.A.; Tovkach, L.M. (Leningradskii Ehlektrotekhnicheskii Inst. (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Calculation results of heating tungsten target in the form of a disk 2.5 mm high and with 15mm radius in the result of radiation by electron beam of 8x10 MeV energy are given. Curves of distribution of maximal temperature on the internal and external (cooled) surfaces of the target are presented. Calculations are carried out by means of a program written in the algorithmic "FORTRAN" language. Difference of temperatures in the centres of internal and external surfaces of the target is shown to constitute 300 deg C. The larger part of the cooled surface has the temperature of 100-110 deg C. Temperature increase by the end of each pulse in the centre of focus spot makes up 40 deg C. Two-fold reduction of pulse duration (from $5x10^{-6}$ to $2.5x10^{-6}$ s) results in a noticeable decrease of temperatures. Effect of electron beam parameters on the target heating can be evaluated by means of the suagested program.

60046 (INIS-SU—74, pp 252-256) **Diagnostic complex for high-current electron beam.** Kotlyarevskii, G.I.; Logachev, E.I.; Matvienko, V.M.; Remnev, G.E.; Sterligov, A.G.; Usov, Yu.P. (Tomskii Politekhnicheskii Inst. (USSR). Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Description of diagnostic complex intended for measuremept of parameters of electron beams with 2 MeV energy, 100 kA current, $3x10^4$ J energy is presented. The complex comprises calorimeter, Faraday cylinder, magnetic spectrometer. The Faraday cylinders have 9.5 mm diameter, 41 mm length, 3sub(ns) time resolution. All the devices have been tested in "Tonus" and "Tonus-2M" accelerators.

60047 (INIS-SU—74, pp 53-59) **Usage of a small-sized betatron with extracted electron beam for radiotherapy of surface neoplasms.** Erofeeva, G.V.; Chakhlov, V.L.; Chakhlov, G.L. (Tomskii Politekhnicheskii Inst. (USSR). Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki); Belyaev, N.V.; Zaitseva, T.L.; Lisin, V.A. (Tomskii Meditsinskii Inst. (USSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Investigation results of spatial and energy characteristics of electron beam of the PMB-6E portable betatron with azimuthal variation of the magnetic field and beam extraction by the resonance method are presented. The betatron is intended for treatment of surface new formations, and the energy of electron beam is regulated from 1.6 to 6 MeV. The initial radiation dose makes up 300 rad. Radiation rhythm is once per 6 days. The summary therapeutic dose approaches 600-900 rad. The integral radiation dose does not exceed 1.2 R. An operating mockup of betatron with 1 to 3 MeV energy of the extracted beam, 500 rad/min dose rate at the outlet from the emitter at 20 kg mass of the emitter unit and 200x200x150 mm sizes is produced for treatment of dermatoses.

60048 (INIS-SU—74, pp 60-67) **Characteristics of fast neutron sources of the U-120 cyclotron biological channel.** Letov, V.N.; Ievlev, S.M.; Bel'skiie, E.M.; Khrapachevskii, V.N.; Dryapachenko, I.P. (Nauchno-Issledovatel'skii Rentgeno-Radiologicheskii i Onkologicheskii Inst., Kiev (Ukrainian SSR); AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Investigation results of neutron sources-beryllium and gaseous targets operating on the base of $^9Be(d, n)^{10}B$ and $D(d, n)^3He$ reactions are presented. Measurements of spectra and dose rates of fast neutrons at 1m distance during irradiation of targets of the U-120 cyclotron by deuteron beam with 13.6 MeV energy were conducted in the process of tests. Average energy of fast neutrons on beryllium target constituted 6 MeV and the integral flux made up $3x10^7$ neutrxcm^{-2} s^{-1} at 30 μA deuteron beam current. Average energy of fast neutrons of gaseous target constituted $2.6x10^7$ neutrxcm^{-2}xs^{-1} at the same current of deuteron beam. The absorbed dose rate of beryllium target constituted 0.8 rad/min μA, of gaseous target - 0.5 rad/min μA. Mutual exploitation of both targets permits to use remote therapy of tumours, located at different depths of the body.

60049 (INIS-SU—74, pp 203-210) **Automation measuring complex for study on electron beam spatial-structure.** Kondrat'ev, E.L.; Pis'mennyi, V.D.; Rakhimov, A.T.; Saenko, V.B. (Moskovskii Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skii Inst. Yadernoj Fiziki). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

A diagnostic complex on the base of photographic registration method, which permits promptly acquire qualitative and quantitative information of single-phasing of electron beam in the volume of gas-discharge laser chamber is described. Sheets of transparent viniprose of 0.2 mm thickness are used to obtain print of electron beam. A collector built-in in the viniprose sheet has been used for measuring electron beam discharge. Photometric measurement is exercised according to one-beam scheme. Plotting the equidensitogram takes place on the screen of a memorizing oscillograph. The diagnostic complex permits to promptly determine the shape and dimensions of the beam, mark out beam intensity peaks and their coordinates, as well as to measure distribution of current density on beam cross section and on depth of propagation.

60050 (JINR-D—9-81-280) **High-effective beam extraction for a high-intensity ring cyclotron.** Dmitrievskij, V.P.; Kol'ga, V.V.; Polumordvinova, N.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702379.

The application of the equilibrium orbit expansion effect for the 100% extraction of a high-intense beam from ring isochronous cyclotrons-meson factories, is considered. The requirements to the magnetic field configuration in the extraction zone are defined. The conditions providing the values of emittance and energy spread in the beam at which high effective extraction from the ring cyclotron becomes possible are found. The results of numerical calculations of orbit expansion process for the SIN meson factory and for the JINR electron cyclotron are presented.

60051 (LBL-PUB—426-Rev.7/82) **User facilities at the Lawrence Berkeley Laboratory.** Lemmon, R.M. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 12p. NTIS, PC A02/MF A01. Order Number DE82022056.

Many of the LBL research facilities as well as much of their associated equipment have long been available to qualified outside users. Of these, the facilities used by outside researchers are of two

types: (1) those that have a formal, designated status as a national research facility (the Bevalac, the SuperHILAC, the 88" Cyclotron, and the National Center for Electron Microscopy), and (2) those that lack such formal status and user procedures, but which are used to a significant degree by outside scientists and engineers. The Tritium Labeling Facility is awaiting funding for conversion into a national facility; nearly half of its use is by outside researchers.

60052 **(UCRL—87279) Hybrid charged-particle guide for studying (n, charged particle) reactions.** Haight, R.C.; White, R.M.; Zinkle, S.J. (Lawrence Livermore National Lab., CA (USA); Wisconsin Univ., Madison (USA)). 25 Aug 1982. Contract W-7405-ENG-48. 4p. (CONF-820942—2). NTIS, PC A02/MF A01. Order Number DE82020864.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Charged-particle transport systems consisting of magnetic quadrupole lenses have been employed in recent years in the study of (n, charged particle) reactions. We have completed a new transport system that is based both on magnetic lenses as well as electrostatic fields. The magnetic focusing of this charged-particle guide is provided by six magnetic quadrupole lenses arranged in a CDCCDC sequence (in the vertical plane). The electrostatic field is produced by a wire at high voltage which stretches the length of the guide and is physically at the center of the magnetic axis. The magnetic lenses are used for charged particles above 5 MeV; the electrostatic guide is used for lower energies. This hybrid system possesses the excellent focusing and background rejection properties of other magnetic systems. For low energy charged-particles, the electrostatic transport avoids the narrow band-passes in charged-particle energy which are a problem with purely magnetic transport systems. This system is installed at the LLNL Cyclograaff facility for the study of (n, charged particle) reactions at neutron energies up to 35 MeV.

60053 **Neutron guide tube gain for a remote finite source.** Carpenter, J.M. (Argonne National Lab., Il (USA). Intense Pulsed Neutron Source Program); Mildner, D.F.R. (Missouri Univ., Columbia (USA). Research Reactor Facility). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 2/3, 341-348(15 May 1982).

Neutron guide tubes are essential features of many neutron beam instruments. Even though detailed analysis of practical systems including guide curvature and reflectivity losses may require numerical calculation, analytical methods such as the present one are useful for understanding idealized systems and for assessing the accuracy of numerical methods. We use a technique which is an adaptation of one used in the analysis of particle transport in accelerators, describing trajectories in the transverse (i.e. position and angle) phase space of the neutrons. Similar methods are well known in neutron optics which have been used to calculate transmissions of neutron choppers and guides, and which rest upon representations in either two momentum or two spatial dimensions. We derive expressions for the gain (ratio of the total neutron current through the guide to the total current without internal reflections) of parallel-sided one-dimensional neutron guide tubes, explicitly including the effects of a remote finite source. We identify several distinct cases. For the realistic situation of a two-dimensional guide of rectangular cross section, the gain is the product of gains computed for the one-dimensional systems in each dimension.

60054 **Transverse wake force in periodically varying waveguide.** Cooper, R.K. (Los Alamos National Lab., NM (USA)); Krinsky, S. (Brookhaven National Lab., Upton, NY (USA)); Morton, P.L. (Stanford Univ., CA (USA). Stanford Linear Accelerator Center). *Particle Accelerators;* **12**: No. 1, 1-12(Mar 1982).

The transverse wake forces due to a perturbed charge distribution moving parallel to the axis of a circular waveguide have been investigated. Equations for the field components, the boundary conditions, zero, first and second order solutions, and the transverse forces due to zero order fields, are considered.

60055 **Magnet pole tips.** Thorn, C.E.; Chasman, C.; Baltz, A.J. (to Dept. of Energy). US Patent Application 323,150. 19 Nov 1981. 19p. Contract AC02-76CH00016.

An improved magnet more easily provides a radially increasing magnetic field, as well as reduced fringe field and requires less power for a given field intensity. The subject invention comprises a pair of spaced, opposed magnetic poles which further comprise a pair of pole roots, each having a pole tip attached to its center. The pole tips define the gap between the magnetic poles and at least a portion of each pole tip is separated from its associated pole root. The separation begins at a predetermined distance from the center of the pole root and increases with increasing radial distance while being constant with azimuth within that portion. Magnets in accordance with the subject invention have been found to be particularly advantageous for use in large isochronous cyclotrons.

60056 **Progress report on future accelerators.** Panofsky, W.K.H. pp 957-970 of Proceedings of the 1981 international symposium on lepton and photon interactions at high energies. Pfeil, W. (ed.). Bonn, Germany, F.R.; Physikalisches Institut, Universitaet Bonn (1981).

From Symposium on lepton and photon interactions at high energies; Bonn, Germany, F.R. (24 - 29 Aug 1981).

The author describes the long-range plans at SLAC concerning colliding electron and positron beams.

60057 **U.S. E-P collider project.** Holmes, S.D. pp 971-982 of Proceedings of the 1981 international symposium on lepton and photon interactions at high energies. Pfeil, W. (ed.). Bonn, Germany, F.R.; Physikalisches Institut, Universitaet Bonn (1981).

From Symposium on lepton and photon interactions at high energies; Bonn, Germany, F.R. (24 - 29 Aug 1981).

I discuss briefly some of the work being done by the U.S. based group which has proposed the construction of an electron-proton collider facility in the United States.

60058 **(PB—82-157637) Shimming a magnet to produce a high homogeneity field for muon spin rotation experiments.** Warner, G.P. (Science and Engineering Research Council, Chilton (UK). Rutherford Appleton Lab.). [nd]. 25p. (RL—81-083). NTIS, PC A02/MF A01.

A 'C' magnet has been shimmed to give a homogeneity of plus or minus 200,000 over a sphere of 50 mm diameter. The method and results are described. (Copyright (c) Science and Engineering Research Council 1981.)

60059 (IPNO—81-05, pp 1-12) **LBL EBIS test-stand.** Feinberg, B.; Brown, I.G. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

The construction of an EBIS research and development test stand is described along with magnetic measurements and bare electron beam experiment.

60060 (IPNO—81-05, pp 13-29) **Status report on CRYEBIS.** Faure, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. du Synchrotron Saturne). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Recent results after magnetic measurements, theoretical studies and technical improvements are given.

60061 (IPNO—81-05, pp 59-118) **Design and measurement of space charge electron beams.** Amboss, K. (Hughes Research Labs., Malibu, CA (USA)). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

The techniques for the production of well formed space charge electron beams are described with a list of the difficulties encountered in case of high area compressions.

60062 (IPNO—81-05, pp 128-136) **Misalignement in an EBIS type structure.** Laclare, J.L.; Leleux, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. du Synchrotron Saturne). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Tolerances of gun location are expressed, with the resultant potential well distortion and mass center rotation along the source.

60063 (IPNO—81-05, pp 137-148) **Preliminary tests of the CRYEBIS gun NC1.** Malard, M.; Serafini, A. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Olivier, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. du Synchrotron Saturne). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Extended measurements of the characteristics of a new gun have been made, including effects of the cathode heater field and drift back of secondary electrons.

60064 (IPNO—81-05, pp 149-158) **Electron beam collection and deceleration device for CRYEBIS II.** Goldstein, C.; Malard, M. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

A single stage depressed collector has been theoretically studied for CRYEBIS II, slowing down and energy recovering would exceed 95 % for a 50KeV-3.5A electron beam.

60065 (IPNO—81-05, pp 159-163) **Electronic collection in CRYEBIS I.** Arianer, J.; Goldstein, C. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Two electron collectors of CRYEBIS I are described. The last one is segmented and would allow a partial depression.

60066 (IPNO—81-05, pp 170-184) **Metallic neutral production for an EBIS.** Collart, C.; Liebe, A.; Nicol, P.; Steinegger, A. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Two ways of metallic element injection are describeb. Production of metallic vapors by a CO_2 laser has been experimentally tested.

60067 (IPNO—81-05, pp 185-196) **Acceleration and heating of multiply charged ions in dense electron beams.** Becker, R. (Frankfurt Univ. (Germany, F.R.). Inst. fuer Angewandte Physik). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

The gain of ion velocity and energy by successive inelastic electron impacts has been calculated and consequences for EBIS are discussed.

60068 (IPNO—81-05, pp 197-211) **Electron and ion-beam diagnostics on CRYEBIS.** Deschamps, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. du Synchrotron Saturne). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

A description of the CRYEBIS electron-beam diagnostics to control the alignment and the losses of the beam is presented in the first part. In the second part we describe the ion beam detectors and a special emphasy is given to the ion-beam measurements with the time-of-flight analyser, yielding charge-state distribution, ion-energy spread and electron-beam density.

60069 (IPNO—81-05, pp 212-227) **LBL EBIS program.** Brown, I.; Feinberg, B. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

A small EBIS has been built to gain experience in this field to determine what is essential to a full scale device. The final device would be installed on the LBL 88 inch cyclotron and also used for atomic physics experiments.

60070 (IPNO—81-05, pp 228-239) **Utilization of the EBIS with RFQ linacs.** Hamm, R.W.; Wangler, T.P. (Los Alamos Scientific Lab., NM (USA)). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

The radio-frequency quadrupole (RFQ) is a new linear accelerator structure in which rf electric fields are used to simultaneously focus, bunch, and accelerate an ion beam. Since the RFQ can provide strong focusing and adiabatic bunching at low velocities, it can capture almost all of the ions extracted from an Electron Beam Ion Source (EBIS) at a low voltage and accelerate them to an energy of 1-2 MeV/nucleon in a distance of only a few meters. A successful test at the Los Alamos National Laboratory has confirmed the calculated performance of this structure and has stimulated interest in its use with the EBIS for a variety of applications. The general properties of the RFQ are reviewed, and the utilization of the EBIS with this structure is discussed. Several design examples of this combination are also presented.

60071 (IPNO—81-05, pp 240-245) **CRYEBIS II project.** Arianer, J.; Brient, M.; Collart, C.; Goldstein, C.; Mac Farlane, J.; Malard, M.; Nicol, P.; Serafini, A.; Streinegger, A. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

The characteristics of a new source of the CRYEBIS generation are given. This source is foreseen for basic research, atomic and plasma physics experiments and would produce very highly charged ions (up to U^{90+}).

60072 (IPNO—81-05, pp 246-262) **Use of EBIS generation of ion sources in new superconducting cyclotrons.** Gales, S. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

After a brief presentation of the existing accelerator facilities at ORSAY, the main features of the ORSAY proposal for a new accelerator system are presented. The future goals of this project (energy range, variety of ions and beam qualities) are briefly discussed. The expected performances of an EBIS type ion source coupled via an axial injection to a superconducting cyclotron are presented. The coupling of multicharged ion sources to new superconducting cyclotrons seems to have promising and rather unique capabilities for the acceleration of very heavy ions ($A > 100$) in the energy range of 10 to 80 MeV per nucleon.

4304 Storage Rings

60073 (BNL—31571) **National Synchrotron Light Source and special radiation-sources development.** van Steenbergen, A. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 31p. (CONF-820741—1). NTIS, PC A03/MF A01. Order Number DE82018058.

From Synchrotron radiation conference; Novosibirsk, USSR (27 Jul 1982).

Portions of document are illegible.

Design features are presented of the two high current electron storage rings comprising the National Synchrotron Light Source and its basic parameters are enumerated. In addition, an overview is presented of the special radiation sources under construction and development, including a superconducting wiggler,

permanent magnet wiggler, x-ray and vuv undulators, free electron laser source and Compton backscattered γ source.

60074 **(LBL—14215) Alternative dipole magnets for ISABELLE.** Taylor, C.; Althaus, R.; Caspi, S.; Gilbert, W.; Hassenzahl, W.; Meuser, R.; Rechen, J.; Warren, R. (Lawrence Berkeley Lab., CA (USA)). May 1982. Contract AC03-76SF00098. 6p. (CONF-820546—9). NTIS, PC A02/MF A01. Order Number DE82020549.

From 9. international cyrogenic engineering conference; Kobe, Japan (10 May 1982).

A dipole magnet, intended as a possible alternative for the ISABELLE main-ring magnet, was designed at LBL. Three layers of FNAL Doubler/Saver conductor were used. Two 1.3-m-long models were built and tested, both with and without an iron core, and in both helium I and helium II. The training behavior, cyclic energy loss, point of quench initiation, and quench velocity were determined. A central field of 6.5 tesla was obtained in He I (4.4 K), and 7.6 tesla in He II (1.8K).

60075 **Future plans of storage rings at Cornell.** McDaniel, B.D. pp 921-925 of Proceedings of the 1981 international symposium on lepton and photon interactions at high energies. Pfeil, W. (ed.). Bonn, Germany, F.R.; Physikalisches Institut, Universitaet Bonn (1981).

From Symposium on lepton and photon interactions at high energies; Bonn, Germany, F.R. (24 - 29 Aug 1981).

I speak first about the plans for CESR and then go on to talk about our plans for a 50 GeV storage ring CESR II.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 59500, 59559, 60133, 60168, 60185, 60334. 60349, 60500, 60510

60076 **(BNL—31347) MPS II drift-chamber system.** Etkin, A.; Eiseman, S.; Foley, K.J. (Brookhaven National Lab., Upton, NY (USA); City Coll., New York (USA)). 13 May 1982. Contract AC02-76CH00016. 3p. (CONF-821011—1). NTIS, PC A02/MF A01. Order Number DE82016143.

From IEEE nuclear science symposium; Washington, DC, USA (20 Oct 1982).

A new system of detectors (MPS II) which has been installed and operated in the Brookhaven National Laboratory Multiparticle Spectrometer (MPS), consisting of short drift distance drift chambers is briefly described. (WHK)

60077 **(CEA-CONF—6035) Individual gamma dosemeter MD 20: Physical tests and evaluation tests.** Laureana, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Mar 1981. 12p. (In French). (CONF-8103136—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702407.

From Scientific and technical meeting of the French Health Physics Society; Lamanon, France (25 Mar 1981).

Tests on the digital individual dose ratemeter type DM 20 for gamma radiation measurement are presented. The aim of this testing is an evaluation of main physical characteristics under irradiation. Results are given in tables and graphs. Relative sensitivity versus dose rate is better than +14% for cobalt 60 photons with a good linearity. There is no detector saturation until 400 to 450 rad/h. The energy response is lower than +- 20% between 160 keV to 1.25 MeV. Autonomy is over 4000 hours. All informations: dose, dose rate and good working conditions are directly read.

60078 **(CEA-CONF—6065) Gamin portable radiation meter with alarm threshold.** Payat, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Oct 1981. 8p. (In French). (CONF-8110191—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702410.

From Information meeting of the French Health Physics Society; Loches, France (15 Oct 1981).

The Gamin Radiation meter is a direct reading, portable, battery-powered gamma doserate meter featuring alarm thresholds. Doserate is read on a micro-ammeter with a millirad-per-hour logarithmic scale, covering a range of 0,1 to 1000 millirads/hour. The instrument issues an audible warning signal when dose-rate level exceeds a threshold value, which can be selected. The detector tube is of the Geiger-Muller counter, energy compensated type. Because of its low battery drain, the instrument can be operated continously for 1000 hours. It is powered by four 1.5 volt alcaline batteries of the R6 type. The electronic circuitry is housed in a small lightweight case made of impact resistant plastic. Applications of the Gamin portable radiation monitor are found in health physics, safety departments, medical facilities, teaching, civil defense.

60079 **(CONF-801103—68) Performance of room temperature mercuric iodide (HgI_2) detectors in the ultra low energy x-ray region.** Dabrowski, A.J.; Iwanczyk, J.S.; Barton, J.B.; Huth, G.C.; Whited, R.; Ortale, C.; Economou, T.E.; Turkevich, A.L. (EG and G, Inc., Goleta, CA (USA); California Univ., Marina Del Rey (USA). Medical Imaging Science Group; Chicago Univ., IL (USA). Enrico Fermi Inst.). 1980. Contract AC08-76NV01183. 16p. NTIS, PC A02/MF A01. Order Number DE82017065.

From IEEE nuclear science symposium; Orlando, FL, USA (5 Nov 1980).

Portions of document are illegible.

Performance of room temperature mercuric iodide x-ray spectrometers has been recently improved through new fabrication techniques and further development of low noise associated electronic systems. This progress has extended the range of measurements to the ultra low energy x-ray region at room temperature. This paper reports the study of the effect of contact material on the performance of HgI_2 detectors in the low energy x-ray region.

60080 **(DOE/ER/40048—2L2) Liquid-argon heavy-ion ionization detector.** Loveman, R.A.; Gruhn, C.R.; Pang, W.; Roach, M. (Washington Univ., Seattle (USA). Nuclear Physics Lab.; Lawrence Berkeley Lab., CA (USA)). 1980. Contract AC06-81ER40048. 6p. NTIS, PC A02/MF A01. Order Number DE82020195.

We have made a preliminary study of liquid ionization chambers devices as detectors of heavy ions. It appears that the extremely recombinant track structure and energy loss fluctuations limit energy resolution. If this can be overcome and the energy resolution improved, the detector could be a useful device for long range (.7 to 3.5 gm/cm^2 argon) charged particles.

60081 **(DOE/EV/10374—2) Direct determination of ^{222}Rn gas using the electret to remove daughters at formation. Annual progress report, June 1, 1981-May 31, 1982.** Harley, N.H. (New York Univ., NY (USA). Medical Center). 1982. Contract AC02-80EV10374. 24p. NTIS, PC A02/MF A01. Order Number DE82020802.

This report covers progress made from 1 June 1981 to 31 May 1982 in developing a continuous monitor which measures only ^{222}Rn without interference from the daughters. Five ^{222}Rn counters have been built which determine ^{222}Rn alone by alpha scintillation counting in the presence of an electret to remove the short-lived daughter products from the counting chamber. The chamber design is based on the work of Chittaporn et al., (1981) at New York University's Department of Environmental Medicine. The detection chamber is a 1.8 liter (12.7 cm diameter by 14 cm high) cylinder lined with zinc sulfide alpha phosphor. The detector sits directly on a 12.7 cm diameter phototube. The 5 units have calibration factors which range from 155 to 186 counts/hour per pCi ^{222}Rn/liter and an average background count of 6 counts/hour. The lower limit of detection for a one hour count is thus 0.03 pCi ^{222}Rn/l, well below environmental levels.

60082 **(EFI—470(13)-81) Calculation of characteristics of the pair magnetic spectrometer in 20-200 MeV energy range.** Yaralov, V.Ya. (Erevanskij Fizicheskij Inst. (USSR)). 1981. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702411.

The characteristics of pair magnetic spectrometer are calculated with the Monte-Carlo method for 20-200 MeV energies of γ-quanta in the deflection mode of charged particles by the edge field, for which a simulation algorithm of e e pair momentum and angular distributions is constructed. The multiple scattering in target is considered. The particle trajectory in the edge magnetic field is calculated. The results of simulation of the spectrometer performance for the following location of the target and counters are presented: the target is placed on the outside of the magnet at 1.3 cm from the geometrical edge, two front counters are at 211 cm from the magnet edge and the third counter is at 39 cm from them. It is established that the efficiency of pair detection changes from 2.5×10^{-5} for 35 MeV to 3.4×10^{-4} for 150 MeV.

60083 **(FERMILAB/TM—1125) Sensitive and simple method for measuring wire tensions.** Atac, M.; Mishina, M. (Fermi National Accelerator Lab., Batavia, IL (USA); National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Aug 1982. Contract AC02-76CH03000. 9p. NTIS, PC A02/MF A01. Order Number DE82021918.

Measuring tension of wires in drift chambers and multiwire proportional chambers after construction is an important process because sometimes wires get loose after soldering, crimping or glueing. One needs to sort out wires which have tensions below a required minimum value to prevent electrostatic instabilities. There have been several methods reported on this subject in which the wires were excited either with sinusoidal current under magnetic field or with sinusoidal voltage electrostatically coupled to the wire, searching for a resonating frequency with which the wires vibrate mechanically. Then the vibration is detected either visually, optically or with magnetic pick-up directly touching the wires. Any of these is only applicable to the usual multiwire chamber which has open access to the wire plane. They also need fairly large excitation currents to induce a detectable vibration to the wires. Here we report a very simple method that can be used for any type of wire chamber or proportional tube system for measuring wire tension. Only a very small current is required for the wire excitation to obtain a large enough signal because it detects the induced emf voltage across a wire. A sine-wave oscillator and a digital voltmeter are sufficient devices aside from a permanent magnet to provide the magnetic field around the wire. A useful application of this method to a large system is suggested.

60084 **(IAEA-R—2310-F) Research within the coordinated programme on investigation of maintenance of nuclear instrumentation in developing countries. Latin America. Final report for the period 1 February 1979 - 31 January 1980.** Guzman-Acevedo, C. (International Atomic Energy Agency, Vienna (Austria)). Jun 1980. 17p. NTIS (US Sales Only), PC A02/MF A01.

The situation in Peru with regard to the maintenance and repair of instruments used in nuclear medicine is presented. On the basis of responses to questionnaires it appears that 56 instruments for nuclear medicine are in use in the country, almost exclusively in the capital Lima. The average age of the instruments is 9.5 years. They are in use about 16.4% of the possible time. The development of nuclear medicine in Peru is in its initial stages and difficulties encountered arise both from the lack of training and experience in nuclear medicine on the part of the medical personnel as well as lack of experience of the technicians responsible for instrument maintenance. Practically no preventive maintenance ever takes place; action is only taken when an instrument breaks down. Various suggestions are made in order to attempt an improvement of the situation.

60085 (INDC(CCP)—163/GR, pp 19-27) **Methods of neutron spectrum calculation from measured reaction velocities in SAIPS.** Berzonis, M.A.; Bondars, Kh.Ya. (Latvijskij Gosudarstvennyj Univ., Riga (USSR)). May 1981. Dep. NTIS (US Sales Only).

In Translation of selected reports on neutron spectrum unfolding.

When a user (physicist) needs to perform calculations, he faces a number of problems: obtaining or generating calculation programs, comparing these programs, generating a library of reference spectra, study of calculated spectra and so on. This means routine work which is duplicated in many laboratories. To help solve these problems a computerized information system called SAIPS has been developed, some aspects of which are dealt with in references. The present paper gives a short description of data input into SAIPS and the basic principles of its utilization. SAIPS is based on the ES 1022 computer controlled by the operational system OS ES version 4.1. It contains the programs needed for unfolding spectra, neutron cross-section and reference spectrum libraries and the software for the main system and for computerized calculations.

60086 **(INDC(CCP)—163/GR) Translation of selected reports on neutron spectrum unfolding.** (International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee). May 1981. 41p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780638.

Abstracts of individual items from the collection were prepared separately for the data base. (GHT)

60087 (INIS-mf—6311, pp 349-356) **Radiometric methods application for determination of some parameters of materials and media.** Kubichek, P.; Kubichkova, Ya.; Mraxek, L. (Vyzkumny Ustav Hutnictvi Zeleza, Dobra (Czechoslovakia). Informetal). 1979. (In Russian). NTIS (US Sales Only).

From Symposium on the radioisotope methods application in industry, including means of control and operation; Leipzig, German Democratic Republic (26 Sep 1978).

Method is described of simultaneous measurement of the absorbed and scattered radiation for determination of the volume density of a material on a conveyor belt and also the method is described of measurement of the scattered gamma-radiation with two different energies for determination of chemical composition of a material. Both methods do not require constant thickness of the measured material's layer. Method of the gamma-radiation backscattering measurements is used for creation of the gauge for measurement of the number of solid particles in a gas flow. Modification is described of a radiometric balance of continous action with use of a moving radiation source.

60088 (INIS-mf—6311, pp 245-248) **Acquaintance with the analyzer, developed for the X-ray fluorescence analysis of materials.** 1979. (In Russian). Dep. NTIS (US Sales Only).

From Symposium on the radioisotope methods application in industry, including means of control and operation; Leipzig, German Democratic Republic (26 Sep 1978).

In brief principle is given of performance of the instrument for X-ray fluorescent analysis of materials, analyzer of the 31800 type, having been developed at the Electronic Measuring Instruments Factory in Hungary. The instrument described is one of the parts of the system of electron microscope manufactured in the frameworks of cooperation between the enterprises: "Tesla"-Czechoslovakia; EMG - Hungary and Rossendorf - GDR.

60089 (INIS-mf—6937, pp vp) **Alpha-beta-gamma scintillation spectrometer. The state of the art.** Kalish, Y. (Beilinson Hospital, Petah Tiqva (Israel). Dept. of Medical Physics); Sadeh, Y.; Behar, D.; Oren, M.; Peled, S.; Simon, A. (Beta Engineering and Development Ltd., Beer-Sheva, (Israel)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60090 (INIS-mf—6937, pp vp) **Length limitation of liquid scintillation neutron spectrometers.** German, U. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60091 (INIS-mf—6937, pp vp) **Fading of CaF_2:Dy.** Ben-Shachar, B.; German, U.; Weiser, G. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60092 (INIS-mf—6937, pp vp) **Integrated system for recording personnel neutron exposures over a wide energy range.** Eisen, Y.; Shamai, Y.; Faermann, S.; Ovadia, E.; Rosemann, M. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60093 (INIS-mf—6937, pp vp) **Effect of high gamma-radiation doses on the detection efficiency of chemical bond particles in polycarbonates.** Faermann, S.; Eisen, Y.; Schlesinger, T. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center); Kushilevski, A. (Ben-Gurion Univ. of the Negev, Beersheba (Israel)). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60094 (INIS-mf—6937, pp vp) **Beta dosimetry.** Shamai, Y.; Tal, A.; Eisen, Y. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60095 (INIS-mf—7073) **HgI_2 monocrystals to be used as material for gamma and X-ray detectors.** Tomzig, E. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Fachbereich Ingenieurwissenschaften). 3 May 1979. 145p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780685.

Thesis.

By means of the gas-zone sublimation method it was possible to grow α-HgJ_2 crystals whose surfaces (10 x 10 mm^2) had got a high surface perfection and therfore could be used for optical measurements without preparation. Because of the ampoule geometry applied and the oil bath heating large α-HgJ_2 crystals (20 g) could be grown by means of sublimation in the moved simple gradient. Moreover it was managed for the first time to separate HgJ_2 crystals from iodine solutions. In order to be able to carry out the growth from iodine solutions the phase diagram J_2-HgJ_2 was determined by means of differential thermal analysis. The purity of the crystals was tested by means of spectrochemical and mass-spectrometric analyses as well as with the scanning electron microscope. By means of differential thermal analysis non-stoichiometries could be made evident. Luminescence and reflection measurements served for determination of homogeneity, distortions caused by preparation, and damages of the crystals. With the aid of the detecton produced γ spectra were recorded and the photocurrent generated by irradiation with X-rays was measured. Strong polarization effects were observed.

60096 (INIS-SU—29, pp vp) **Measuring system for instrumental activation analysis using the VECTOR units.** Bovin, V.P.; Eldashev, V.V.; Ivanov, I.N.; Kurochkin, S.S.; Malinovskii, V.N.; Rogushin, I.I.; Fishbejn, V.L. 1979. (In Russian). Dep. NTIS (US Sales Only).

In Radiation technology.

Measuring systems for instrumental activation analysis, developed on the base of standard units of the VECTOR system, are described. Structural flowsheets of measuring and spectrometric channels of installations for activation analysis are considered. Main elements of measuring channels of these installations are signal amplifiers, devices of amplitude and time selection of pulses, analong-to-digital converters, counters, counting rate meters, units of data input-autput and devices of automatic control. The suggested measuring systems are intended for operation with scintillation and semiconductor detectors, as well as for neutron flux monitoring. Minicomputers are used to exercise control over analysis process, and to process the obtained data. The considered measuring systems can be used not only for activation analysis, but for X-ray fluorescent and X-ray structural analyses as well.

60097 (INIS-SU—74, pp 17-23) **Experience in application of the LUE-25 and B5M-25 electron accelerators in clinical oncology.** Kanaeve, S.V.; Kozlov, A.P.; Gremilov, V.A. (Akademiya Meditsinskikh Nauk SSSR, Leningrad. Inst. Onkologii). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Experience of using electron beams with 10-27 MeV energy and bremsstrahlung, obtained by means of the B5M-25 betatron and the LUE-25 linear accelerator in beam therapy of malignant tumours is analyzed. The problems of developing optimal individual plans of beam treatment of patients of different age groups, are discussed. A conclusion is made on perspectiveness of using electron accelerators in oncologic practice.

60098 (INIS-SU—74, pp 313-321) **Measuring of pulses of bremsstrahlung from accelerators.** Strakovskaya, R.Ya. (AN Ukrainskoj SSR, Donetsk. Inst. Fizicheskoj Khimii); Kremenchugskii, L.S. (AN Ukrainskoj SSR, Kiev. Inst. Fiziki). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Response of pyroelectric detector as dosimeter of exposure dose on the effect of directed gamma-radiation (accelerator bremsstrahlung) of high intensity and short-time duration includina nanosecond range is investigated. Contribution of induced current due to compton-effect is taken into account in this case and ways of design pyrodetectors with minimal influence of compton-effect is pointed out. The conducted calculations are in satisfactory agreement with test results of pyroelectric detector samples.

60099 (INIS-SU—103, pp 8-15) **One-dimensional ionizing radiation detector on the charge-coupled device basis.** Kuskov, V.E.; Stenin, V.Ya. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

Basic features of the one-dimensional ionizing radiation detector designed on the charge-coupled device (CCD) basis with surface as well as deepened channel are studied. The eta (E) dependence of the detector quantum efficiency on the density of soft X radiation energy is given. It has been found on the basis of the analysis of the eta(E) dependence that the most acceptable range of using CCD-detectors lies in the limits of radiation energy from 2 to 12 keV. In this energy region the linearity of ionizing radiation flux conversion into electrical charge is assured. The CCD-detector sensitivity constitutes $2x10^8$ photon/(cm^2xs). The upper limit of the detector dynamic range equals to 10^{10} photon/(cm^2xs) while the whole dynamic range equals to 50. The effect of long-term irradiation on the basic features of the CCD-detectors is considered as well as restoration methods of their operating performances are proposed. The real irradiation levels, which the CCD-detectors made on the n-Si base withstand, constitute $(1-3)x10^4$ rad. It is pointed out that most prospective CCD-detectors are those with a deepened channel and Schottky gates in which control through the oxide layer is missing.

60100 (INIS-SU—103, pp 91-94) **Decoupling amplifier with the improved suppression of noises of the general type.** Zusman, G.V. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

The decoupling amplifier meant for suppression of noises of general type accompanying the low level (up to 10 mV) useful signal is described. The decoupling amplifier comprises one isolated channel which is employed for useful signal transmission as well as for input amplifier feeding. The principle scheme of decoupling amplifier consisting of a generator, demodulator, transformer and rectifier, is presented. The amplifier has the following basic parameters: voltage transfer coefficient K=2, instability being less 1% in the input signals range up to +-20 mV; instability K at the supply voltage variation being +-5% is less 1%; upper frequency limit over the 3d B level - 5 kHz, transfer capacity - 2 pF. The decoupling amplifier developed is intended for using in the systems of data collection and processing for low level signal measurement.

60101 (INIS-SU—103, pp 88-90) **Registration of the multisecond pulse duration by means of the low-frequency recorder.** Ostashkin, S.P. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

The electronic pulse duration converter which enables to perform documentary registration of the millisecond pulse shape on the paper tape of the low-frequency recorder is described. The converter comprises an equipment for analog signal recording and reading, analog data storage, as well as a control unit. The converter structural scheme is presented and its operation principles are considered. The main error of pulse shape conversion is determined by two reproduction error components. The first of them $epsilon_1$ is connected with voltage change at the memory capacitor for the time of reading. The second component $epsilon_2$ is connected with voltage change at the memory capacitor for the time of storage. In the developed converter $epsilon_1 <= 2.5\%$ and $epsilon_2 <= 0.5\%$.

60102 (INIS-SU—103, pp 39-46) **Calculation of the rising rate of the output voltage of the operational amplifier.** Ivanov, S.G.; Matavkin, V.V.; Suslov, V.N. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

Calculation of the rising rate of the output voltage of an operational amplifier is given. Bipolar model of the operational amplifier is analyzed and the output voltage rising rate of the operational amplifier corrected by RC-circuit is calculated. As a result of numerical calculation the rising rate of output voltage of the 153UD3 operational amplifier equal to 0.25 V/μs has been determined. The result obtained agrees well with the experimental one.

60103 (INIS-SU—103, pp 15-18) **Method of increasing the accuracy of analog-to-digital converters on the charge-coupled devices.** Smorygo, O.G. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

The method of increasing the accuracy of conversion of analog-to-digital converters (ADC) of conveyer type with analog delay circuits on the charge-coupled devices (CCD) is considered. In these ADC flux comparison of charges corresponding to the analog and standard signal is realized. To compare the charges the equipment of nondestructive charge reading with floating gate is used, the consistency of the performance of the equipment essentially affects the accuracy of charges comparison. To decrease the error of information charges comparison it is suggested to unite identical floating gates by means of which the charge reading from different analog memory units on the charge-coupled devices is effectuated. In this case the effect of reading equipment nonconsistency on the accuracy of charge comparison is weakening. The charge read-out method allows to improve the accuracy of information charge comparison several times or scores of times at the number of united identical gates being not more than 10.

60104 (INIS-SU—103, pp 29-32) **Scaler with the changeable scaling coefficient on the elements with the in ection supply.** Lukashevich, M.V. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

The scaler with the changeable scaling coefficient in which variation of tuning levels is effectuated at external microcircuit outputs is described. The specific feature of the above scaler is its construction on the injection supply elements which allow to considerably simplify the control unit scheme. The basis of the scaling cell is D-trigger operating over the clock pulse trailing edge front. The feedback loop is chosen by means of tuning inputs. As a control code generator the trigger n-digit register can be used. The scaling factor values depending on the code written in the 3-digit control register are given. The developed scaler reliably operates in the 0.4-3.6 mA supply current variation range. Maximum speed of operation equal to 2 MHz at maximum current Isub(n)=3.6 mA, consumed power being 2.5 mW. Scalers with the changeable scaling coefficient are meant for digit automatics equipment in which frequent and operative scaling factor variation is necessary.

60105 (INT—140/E) **Nuclear radiation spectrometry with use of semiconductor detectors. Pt. 2.** Lacki, E.; Krasowski, R. (Institute of Physics and Nuclear Techniques, Krakow (Poland)). 1980. 65p. (In Polish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82702413.

A general explanation of charge-sensitive preamplifiers, including an analysis of preamplifiers with resistive and non-resistive feedback and concluding with an overview of conventional and contemporary devices is presented.

60106 (INT—141/E) **Nuclear radiation spectrometry with use of semiconductor detectors. Pt. 3.** Dabek, T.; Korbel, K. (Institute of Physics and Nuclear Techniques, Krakow (Poland)). 1979. 46p. (In Polish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702414.

The paper deals with problems of determination and measurement of the nominal parameters of charge-sensitive preamplifiers for semiconductor radiation detectors. In particular these problems concern: the definition and meaning of nominal parameters, the general conditions of measurements, measuring equipment as well as the recommended test procedures. The paper is based on the drafts of standardizing recommendations proposed by the International Electrotechnical Commission and those by the Standing Committee for Peaceful Use of Nuclear Energy at the Council for Mutual Economical Aid.

60107 (INT—143/E) **Nuclear radiation spectrometry with use of semiconductor detectors. Pt. 4. Problems of pulses shaping in high resolution spectrometry systems.** Dabrowski, W.; Ostachowicz, J. (Institute of Physics and Nuclear Techniques, Krakow (Poland)). 1980. 48p. (In Polish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702415.

The methods of the improvement of energy resolution of the spectrometer with a semiconductor detector are discussed. The theoretical bases of the filtration in high resolution spectrometry are given. The parameters of the time invariant and time variant filters are compared. There are presented also the shaping circuits with pole zero consellation, the base line restorers and pile up inspector circuits.

60108 (JINR-R—13-81-541) **Development of a gamma camera based on a multiwire proportional counter.** Anisimov, Yu.S.; Zanevskij, Yu.V.; Ivanov, A.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1981. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702417.

From 4. Conference on the usage of new nuclear-technical methods for diciding scientific-technical and national economical problems; Dubna, USSR (Sep 1981).

The developed high-pressure gamma-chamber based on a gas multiwire detector is discussed. The main characteristics of the detector for a gamma-ray energy of up to 100 keV are given. The chamber operation is possible at a pressure of up to 10 atm. The detector is filled with a Xe-CH_4 (90-10) mixture. The detector efficiency is about 50%, the space resolution is better than 2 mm at a working region of 280x280 mm.

60109 (UCRL—50007-81, pp 17-24) **Neutron spectrometry developments: detector improvements and characterization.** Thorngate, J.H.; Rueppel, D.W. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

For the past ten years there has been an active program in the Hazards Control Department to develop neutron spectrometry techniques for application to radiation protection problems. The duration of this program indicates two things: (1) the difficulty of the problem and (2) a continuing recognition of the need for neutron spectrometry. Since our last report on the progress in this program we have spent considerable effort on (1) optimizing the design of existing detectors and (2) carefully measuring their response to gamma rays and neutrons of known energies.

60110 (UCRL—50007-81, pp 25-28) **Six-inch-square phoswich detector array for plutonium lung counting.** Anderson, A.L.; Kaifer, R.C. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

Two 6-in.- (15.2-cm-) square phoswich detectors obtained from the Harshaw Chemical Company have been evaluated for possible application as plutonium lung counters. Although our evaluation is still preliminary, the data collected to date suggest that the use of these detectors for routine lung counting would reduce the minimum detectable activity for isotopically pure ^{239}Pu by about 40%, such that a maximum permissible lung burden of pure ^{239}Pu (16 nCi) could be detected in a plutonium worker of average stature with 2.6-cm chest-wall thickness in a 4000-s count. At present, using two 11.4-cm-diam phoswich detectors, one lung burden of ^{239}Pu is not detectable in the same counting time. Our preliminary data also suggest a reduction in the Minimum Detectable Activity for ^{241}Am, even though the background count-rate for these detectors is much higher in the 60-keV band used for spectral analysis.

60111 (UCRL—50007-81, pp 37-40) **Remmeters for pulsed sources of neutrons.** Thorngate, J.H.; Hunt, G.F.; Rueppel, D.W. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

Measurements of neutron dose equivalents around fusion experiments are complicated by the pulsed nature of the sources. Common remmeters, using proportional counter detectors, may have detector signals whose lengths are comparable to the length of the source pulse. When this occurs, significant underestimates of the dose equivalent may be recorded. We were asked by the health physicists to consider this problem with a particular emphasis on the needs of the MFTF Program; this is an experiment in magnetically confined fusion technology that expects to produce one or two pulses per hour at most, with lengths as short as 50 ms or as long as seconds. The low pulse-repetition rate ruled out the use of silver activation detectors such as the Los Alamos Albatross. Although a modification of this technique that followed the decay of the silver might have been useful, the relatively long length of the minimum-width pulse led us to consider using a detector with a fast response time. The result was essentially a simple remmeter with extremely high count-rate capabilities.

60112 (UTNL-R—0073, pp 24-28) **Measurement of neutron reaction rate by thermoluminescent dosimeter (TLD) self dosing method.** Maekawa, H. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). 1979. (In Japanese). Dep. NTIS (US Sales Only).

From Meeting on measuring methods by thermoluminescent dosimeters; Tokai, Japan (15 Mar 1979).

The measurement of neutrons by self dosing method using a TLD is the same in principle as the measurement with an activated foil. It cleverly utilizes the property of a TLD, and measures the activated dose by using the TLD itself. Since the annealing of a TLD completely eliminates the TL generated by radiation including neutrons, neutron flux can be measured by making another TL generated by the self dosing of a certain nuclide for the appropriate time. The conditions under which the self dosing method is established are as follows. (1) The objective nuclide is contained as a component of a TLD, and its activation cross section is appropriately large. (2) The half life of the nuclide is comparatively larger or smaller than that of coexisting nuclides. (3) The self dosing radiation is β (α)-decay. As the examples of thermal neutron dose measurement, the TLD's of $CaSO_4$; Dy, CaF_2; Dy and CaF_2; natural were fabricated into the ampoules of each about 20 mg, and irradiated in a swimming-pool reactor. The dynamic range may be extended by using ^{45}Ca or ^{165}Dy properly. As the examples for fast neutron dose measurement, LiF and Mg_2SiO_4; Tb TLD's were used. The lower limit of detection is about 2×10^8 n/cm^2 for 14 MeV neutrons. The TLD self dosing method may be used for the measurement of tritium production rate in the blanket of a D-T fusion reactor. Though its efficiency is low at present, its measurement will be achieved by taking the irradiation time and self dosing time long and increasing neutron source intensity.

60113 (UTNL-R—0073, pp 29-32) **Experience of using TLD's at the research reactor in the University of Tokyo.** Oka, Y. (Tokyo Univ. (Japan). Nuclear Engineering Research Lab.). 1979. (In Japanese). Dep. NTIS (US Sales Only).

From Meeting on measuring methods by thermoluminescent dosimeters; Tokai, Japan (15 Mar 1979).

The experiences of using TLD's for the study of therapeutical irradiation field and fast neutron shielding experiment carried out with the fast neutron source reactor "Yayoi" in the University of Tokyo and for the Streaming experiment in the experimental hole of the NSRR (Nuclear Safety Research Reactor) of Japan Atomic Energy Research Institute are described. In the irradiation field of "O" system, it was necessary to obtain epithermal neutrons as many as possible, and to suppress γ-ray as far as possible by moderating the neutrons from the reactor with iron, graphite, polyethylene, lead and bismuth to obtain a therapeutical irradiation field. γ-ray was measured by using BeO and $CaSO_4$ (Matsushita Electric Industrial Co.), and Mg_2SiO_4 powder (Dai Nippon Toryo Co.) filled in 2 mm diameter polyethylene tube (devised by Kyoto University). There was great difference between the measurements with the former two and Mg_2SiO_4, and the influence of glass on the BeO and $CaSO_4$ sealed in the glass tube was supposed in the system with many thermal neutrons such as in water. The similar measurements were performed in three fields called "Q", "R" and "I" systems. When the luminescence of Mg_2SiO_4 powder is read with a TLD reader UD502A, there are difficulties because the background is hundreds of mR, the measuring range is small, and the error is large. Next, the measured results of the γ dose distribution in vertical direction in the central experimental hole for fuel irradiation of the NSRR is described. Since the amount of irradiation to Mg_2SiO_4 was small, its result was larger than others due to background effect.

60114 (UTNL-R—0073, pp 36-40) **Fast neutron dosimetry with thermoluminescence detector (TLD). Experiences of using TLD at Tohoku University.** Takahashi, H.; Kaneko, T.; Iwasaki, S.; Sugiyama, K. (Tohoku Univ., Sendai (Japan). Faculty of Engineering). 1979. (In Japanese). Dep. NTIS (US Sales Only).

From Meeting on measuring methods by thermoluminescent dosimeters; Tokai, Japan (15 Mar 1979).

As one of the experiments for verifying the results of the shield design calculation on the collimator for 14 MeV neutrons using the multi-group Monte Carlo code MORSE, the measurement on the separation of neutrons and γ-ray in an iron system was carried out with TLD's. The neutron source used was the Dynamitron accelerator of 14.8 MeV D-T neutrons at the Faculty of Engineering, Tohoku University, and the TLD elements were UD-136N, UD-137N (the mixture of $CaSO_4$ (Tm) and ^6LiF or ^7LiF powder, respectively) and UD-100S ($CaSO_4$ (Tm)) of Matsushita Electric Industrial Co., and Harshow's ^6LiF and ^7LiF TLD's. To avoid the influence of neutron and γ background, TLD's were installed in the holes drilled in the iron system. In the case of irradiation in a mixed neutron and γ field, since the energy responses to γ-ray of these TLD's are approximately equal, the difference of their thermoluminescences shows the difference of neutron component itself. The causes of the disagreement of calculated results with measured values are supposed to be the dispersion of TLD readings, the accuracy of TLD energy responses, and the problem of the calculated values. Though the self irradiation of TLD's was not accounted for, the influence might not be very large because the irradiation to TLD's installed in ducts was about 3.5×10^8 n/cm^2 for 15 MeV neutrons at most.

60115 (UTNL-R—0073, pp 41-45) **Experiences of using thermoluminescent dosimeter (TLD) in KUR (Kyoto University Reactor). Gamma dosimetry in the mixed field of neutrons and γ-ray.** Furubayashi, T.; Kanda, K. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 1979. (In Japanese). Dep. NTIS (US Sales Only).

From Meeting on measuring methods by thermoluminescent dosimeters; Tokai, Japan (15 Mar 1979).

It has been decided to employ TLDs to measure γ dose in the mixed field of neutrons and γ-ray in the KUR, which has excellent properties such as compact size, light weight, highly sensitive

and simple in handling. Thus, the γ dosimetry with Mg_2SiO_4 (Tb) has been standardized along with thermal neutron dosimetry (using Au foil and Cd cover). The advantages of TLDs are cleanliness and unbreakability in addition to those described above. The shortcoming is that the reading is limited once for all as they are integral type detectors. The element is the polyethylene tube of 1 mm diameter and about 10 mm long fused and sealed at both ends, containing Mg_2SiO_4 powder, and the thermoluminescence is measured by taking the powder out of the tube. It was found that the Mg_2SiO_4 (Tb) element sealed in a polyethylene tube has the sensitivity to fast neutrons. This is caused by recoil protons from the polyethylene wall, and it necessitates to look over again the γ measurement in the mixed field with fast neutrons. Also, commercially available TLD elements have been adopted because their stability was improved. The BeO element enclosed in a ^{6}LiF case has been selected, because its effective atomic number was 7.6, close to 7.4 of living body, and its sensitivity to thermal neutrons is small. At present, the Mg_2SiO_4 (Tb) sealed in a polyethylene tube or the BeO in a ^{6}LiF case is used properly depending on applications.

60116 (UTNL-R—0073, pp 46-50) **Accuracy of thermoluminescence dosimetry. Effectiveness of thermoluminescence intensity analysis.** Sato, T.; Ono, K. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 1979. (In Japanese). Dep. NTIS (US Sales Only).

From Meeting on measuring methods by thermoluminescent dosimeters; Tokai, Japan (15 Mar 1979).

As thermoluminescent phosphors, many materials have been developed and put in practical use in the forms of sealed in glass, sintered, or sealed in heat-resistant resin. Thermoluminescence is converted into electrical signal with a photomultiplier, and its quantity is determined by the integration of the glow of phosphor with time. The factors affecting the measuring accuracy are the quality characteristics depending on elemental components contained in elements, the dispersion of sensitivity among elements, intensifying by pre-dose, fading, superlinearity, coloring and others. The reading apparatuses and calibration method may sometimes involve problems. A thermoluminescence dosimeter (TLD) is a relative measuring instrument to determine dose by comparing the luminescence of a TL element used with that obtained by the reference exposure, and these have no meaning unless they are performed under the same irradiation and measuring conditions. Generally, the calibration of TLDs is conducted in the factories of manufacturers, therefore it is difficult to obtain the same practical measuring conditions, and it leads to the deterioration of accuracy. However, since many of these phenomena appear as the change of glow curves, the errors can be corrected by the analysis. A few examples of the analysis are indicated. Also in X-ray, γ-ray or electron beam dosimetry, the measuring errors due to fading or temperature-raising rate may be reduced if the luminescence intensity is analyzed and the calibration is performed with stable trapped electron luminescence as a reference.

60117 (UTNL-R—0080, pp 57-61) **Calibration of moderator type neutron detector.** Kosako, T.; Nakamura, T. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). 1980. (In Japanese). Dep. NTIS (US Sales Only).

From Neutronics study meeting on standardization of neutron measurements and on present situation of decay heat research; Tokai, Japan (22 Feb 1979).

The BF_3 counters or LiI scintillators used as neutron dosimeters by surrounding them with moderating filters such as polyethylene to change the energy-dependent efficiency of the detectors, or the multi-detectors to determine neutron spectra using the multiple detectors with different moderator thickness have been known for a long time. However, the reason why those methods have not been employed much might be that their response functions have not been calibrated completely, since there is no effective monochromatic neutron source in the region of medium speed energy, or they are susceptible to be affected by scattered radiation. Therefore, it becomes necessary to calibrate the detector response in the form dependent to energy. The commercially available moderator type rem counter and the Harshow BF_3 counter mounted at the center of a polyethylene cylinder whose polyethylene thicknesses are 3, 6 or 10 cm, respectively are described. The practical measurement of response functions and the example of application to ^{252}Cf neutron spectrum field are reported. Though pretty good results were obtained, the calibration in the region from several keV to several eV is still unsolved. For the above discribed rem counter of AB Atomenergi Co. frequently employed as a standard detector in recent years, it is pointed out that it shows 1.5 or 2 times larger response in epithermal energy region.

60118 (UTNL-R—0084, pp 16-20) **Position sensitive neutron detector.** Hasegawa, K.; Mochiki, K. (Tokyo Univ. (Japan). Faculty of Engineering). 1980. (In Japanese). Dep. NTIS (US Sales Only).

From Neutronics study meeting on development of new detectors and NE213 scintillator and on medical irradiation in reactors; Tokai, Japan (20 Dec 1979).

In the last several years, the authors have been carrying out the design and manufacutre of the measuring systems for imported position sensitive neutron proportional counters. The detectors for which the authors have worked are one-dimensional ^{3}He position sensitive proportional counters of central resistance wire type. This paper describes on the characteristics, processing circuits and problems of this type of counters. The signal processing circuit of the central resistance wire type detector is of electric charge split type, and the rise time method is also applicable to high resistance wire type detectors. In the charge split type circuit, the result of division which is realized with an analog IC divider shows the value proportional to the position of incidence of particles. Since, in the two-dimensional measurement of position and energy, a computer is used for data processing, the advantages of digital division become dominant. The measured results, anode resistance, the input impedance of a charge sensitive amplifier, and S/N ratio are considered. The positional resolution of 5.6 mm has been obtained for the 2 mm-slit input. The two-dimensional detector can be made by arranging multiple of resistance anode wires.

60119 (UTNL-R—0084, pp 21-27) **Gas proportional scintillation counter.** Iguchi, T.; Nakazawa, M.; Sekiguchi, A. (Tokyo Univ. (Japan). Faculty of Engineering). 1980. (In Japanese). Dep. NTIS (US Sales Only).

From Neutronics study meeting on development of new detectors and NE213 scintillator and on medical irradiation in reactors; Tokai, Japan (20 Dec 1979).

As the trial in the first stage of utilizing recoil helium for the measurement of 2 - 14 MeV neutron spectra in the simulated blanket for a nuclear fusion reactor, the He-Xe system gas proportional scintillation counter (GPSC) has been manufactured for trial, giving consideration to the advantages of gas scintillators and further to improve the energy resolution. In GPSC, delayed secondary scintillation pulses are produced, and its amplitude gives the energy resolution the adverse effect. Thus, in order to improve the energy resolution, it is desirable to realize such geometry of proportional counters that the electric field in the vicinity of center wire is sufficiently intense to induce the secondary excitation or ionization. The counters of such construction are called GPSC, in which the actual energy resolution can be improved according to the secondary scintillation pulses without losing the fast primary scintillation pulses useful for fast coincidence technique. The experimental results and the consideration on them are described. As compared with proportional counters, GPSC can give large output pulses even at low voltage, improve the energy resolution greatly as compared with ordinary gas scintillators, and measure the time data by the primary scintillation and the energy data based on the secondary scintillation simultaneously. However, it is likely to be affected by gas impurities more than proportional counters, and inferior in the reproducibility and stability of measurement.

60120 (UTNL-R—0084, pp 31-34) **Effect of emission efficiency on the response and unfolding of NE 213 liquid scintillator and measurement of proton emission efficiency.** Sasamoto, N.; Tanaka, S. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). 1980. (In Japanese). Dep. NTIS (US Sales Only).

From Neutronics study meeting on development of new detectors and NE213 scintillator and on medical irradiation in reactors; Tokai, Japan (20 Dec 1979).

The response of NE 213 liquid scintillators to neutrons is determined by the emission efficiency based on protons, α particles and recoil carbon atoms generated in the scintillator by incident

neutrons. The authors investigated in what form the emission efficiency of protons, α particles and recoil carbon atoms contributes to the unfolding of neutron pulse height distribution by the 2 step method. The first stage is the investigation into the relationship of pulse height distribution to the corresponding spectrum, and the second stage is the investigation into the results of unfolding using the response in which the same pulse height distribution was made by employing different emission efficiency data. The pulse height distribution for the spontaneous fissionable neutrons from ^{252}Cf received the unfolding processing by FERDO code, and the influence of emission efficiency on spectra was considered. As a result, the measurement of emission efficiency was tried for only protons. The experiments were carried out using the Van de Graaf accelerator of Japan Atomic Energy Research Institute, and the time-of-flight method by double scintillation was adopted. The experimental values well agreed with Verbinski's new data in the energy range from 2.37 MeV to 0.66 MeV.

60121 (UTNL-R—0084, pp 118-124) **Dosimetry by paired chambers (TEP-TEG and C-CO_2 chamber).** Yoshii, K.; Sasuga, N.; Yanagi, H. (Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.). 1980. (In Japanese). Dep. NTIS (US Sales Only).

From Neutronics study meeting on development of new detectors and NE213 scintillator and on medical irradiation in reactors; Tokai, Japan (20 Dec 1979).

Paired chambers are defined as the combination of a neutron and γ sensitive detector and a γ sensitive one, such as the combination of a tissue equivalent ionization chamber (TEP-TEG chamber) and a carbon ionization chamber (C-CO_2 chamber). The paired chambers have a feature to be capable of measuring the dose in an irradiation field directly by absorbed dose unit. The authors performed dosimetry by using the paired chambers to investigate the possibility of medical and biological researches by means of the fast neutron beam obtained in the reactor "Yayoi". First, the specifications for the paired chambers used, and next, the dose evaluation method are described. The result of dose calibration for the paired chambers shows that the carbon chamber has the reproducibility within 3% deviation and the TEP chamber system has that of 2%. As the examples of measurement, the dosimetry for a living body radiation field by fast neutron beam and that for epithermal neutron irradiation system are reported. The comparison of these dosimetrical results with the other paired chambers seems to show that the satisfactory dosimeter has been produced. The parameters employed for dose conversion are considered to be applicable to the measurement of the epithermal neutron irradiation system.

60122 (ZfK—433(v.1), pp 240-244) **New method of intrinsic alpha particle discrimination using parallel plate avalanche counters.** Neubert, W. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). Feb 1981. Dep. NTIS (US Sales Only).

From 10. international symposium nuclear electronics; Dresden, German Democratic Republic (10 Apr 1980).

An intrinsic alpha discrimination method was developed which permits the separation of fission fragments in ionization chambers. Parallel plate avalanche counters (PPAC) have became an important tool in time-of-flight technique. The properties of a PPAC with two gaps are studied. When decreasing the counter voltage the detector becomes insensitive to alpha particles whereas the fission fragments are registered with 100 per cent efficiency. The rise time of these pulses is increased and the time resolution is deteriorated by a factor about 1.6. The intrinsic discrimination method may be successfully applied in experiments where rare events of heavy particles are hidden in a high background of light particles and large solid angle acceptance or short flight paths are required.

60123 (ZfK—433(v.1), pp 184-188) **Automatic data acquisition system in CAMAC for spectrometry.** Szabo, L.; Szalay, S.; Takacz, P.; Pal, A. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Feb 1981. (In Russian). Dep. NTIS (US Sales Only).

From 10. international symposium nuclear electronics; Dresden, German Democratic Republic (10 Apr 1980).

A special memory module with twofold access for spectrometric information is described. Via the direct access entry three regimes are realized: plus one, minus one and address storage. The visual monitoring is carried out by means of an interface containing a buffer memory for the representation of 4 256-channel spectra and the text on the display. The system work is managed by a controller on the basis of a microprocessor.

60124 (ZfK—433(v.1)) **Proceedings of the 10. International Symposium on Nuclear Electronics.** Flaemig, E.; Koenig, K.H. (eds.). (Joint Inst. for Nuclear Research, Dubna (USSR); Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic); Technische Univ., Dresden (German Democratic Republic)). Feb 1981. 318p. (In English, German, Russian). NTIS (US Sales Only), PC A14/MF A01. Order Number DE82702392.

From 10. international symposium on nuclear electronics; Dresden, German Democratic Republic (10 - 16 Apr 1980).

The report comprises lectures given at the X. International Symposium on Nuclear Electronics. The main topics are the following: improvement of detectors and measuring instruments with regard to higher resolution, stability and effectivity; further development of computerized systems and the application of CAMAC modules and their connection with minicomputers and microprocessors; electronic instrumentation for the automation of reactor and accelerator control systems. Volume I is divided in two sections. Section A: electronic instrumentation for accelerators and reactors. Section B: amplitude and time spectroscopy.

60125 **Wide-range radioactive-gas-concentration detector.** Anderson, D.F. (to Dept. of Energy). US Patent Application 321,946. 16 Nov 1981. 21p. Contract W-7405-ENG-36.

A wide-range radioactive-gas-concentration detector and monitor capable of measuring radioactive-gas concentrations over a range of eight orders of magnitude is described. The device is designed to have an ionization chamber sufficiently small to give a fast response time for measuring radioactive gases but sufficiently large to provide accurate readings at low concentration levels. Closely spaced parallel-plate grids provide a uniform electric field in the active region to improve the accuracy of measurements and reduce ion migration time so as to virtually eliminate errors due to ion recombination. The parallel-plate grids are fabricated with a minimal surface area to reduce the effects of contamination resulting from absorption of contaminating materials on the surface of the grids. Additionally, the ionization-chamber wall is spaced a sufficient distance from the active region of the ionization chamber to minimize contamination effects.

60126 **Spectrometer gun.** Waechter, D.A.; Wolf, M.A.; Umbarger, C.J. (to Dept. of Energy). US Patent Application 317,816. 3 Nov 1981. 33p. Contract W-7405-ENG-36.

A hand-holdable, battery-operated, microprocessor-based spectrometer gun is described that includes a low-power matrix display and sufficient memory to permit both real-time observation and extended analysis of detected radiation pulses. Universality of the incorporated signal processing circuitry permits operation with various detectors having differing pulse detection and sensitivity parameters.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

60127 **Transient effects of ionizing radiation in photodiodes.** Wiczer, J.J.; Dawson, L.R.; Barnes, C.E. (Sandia National Labs., Albuquerque, NM). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **NS-28**: No. 6, 4397-4402(Dec 1981). Contract AC04-76DP00789.

We report here on photodiode structures designed and fabricated to reduce the amplitude of unwanted, noise current induced during exposure to ionizing-radiation environments, without significantly reducing the desired photodiode signal current. For the optical wavelength range from .7 μm to 1.4 μm, we have studied three types of photodiode structures fabricated from AlGaAs, AlGaSb, and InGaAsP compound semiconductor materials. We also have tested and compared these specially fabricated, radiation insensitive

photodiodes with commercially available photodiodes in an ionizing-radiation environment.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 59717, 59827, 60096, 60209, 60307

60128 **(NP-tr—2904691) Flow-rate measurement of gases by means of a Laser-Doppler anemometer.** Dopheide, D.; Narjes, L. (British Gas Corp., London). [nd]. Translation of VDI-375, 1980. 25p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82904691.

Portions of document are illegible.

Laser-Doppler anemometers for gas flows have been developed in recent years to such a high level that this optical measuring process can be used also in industrial applications. In this paper the pre-conditions for accurate volume flow measurements are specified and a complete measuring system is described which, by means of correlated measurement of velocities by optical methods together with pressure and temperature of the gas, can also determine mass flows. The development of the plant was carried out within the framework of a project promoted by the Federal Ministry of Research and Technology.

60129 **(AD-A—112857/8) Study of pyroelectric devices. Part I. Final technical report 1 Apr 72-31 Mar 75.** van der Ziel, A.; Judy, J.H. (Minnesota Univ., Minneapolis (USA). Dept. of Electrical Engineering). 31 Mar 1975. 35p. NTIS, PC A03/MF A01.

This report summarizes work done on the theory of ferroelectric detectors, sources of noise in ferroelectrics and dielectrics, and characteristics and limitations of capacitive bolometers. In addition, results of other work including theory of thermal diffusion in pyroelectric detectors as well as techniques used for material preparation, problems encountered in device fabrication and measurements of D* at 100Hz of PLZT samples are summarized. The main results are that the parameters of the thermodynamical theory of pyroelectric detectors can be expressed in terms of independent fundamental molecular parameters which yield a lossless material figure of merit p/sq root of epsilon in close agreement with experimental valves. This approximate model based on the molecular field approximation predicts that P/sq root of epsilon is almost independent of the material parameters over a wide range of pyroelectric materials. Further improvement in detectivity must come from lowering the material loss parameter tan delta. Theoretical work on the noise sources in ferroelectrics led to the conclusion that the thermal noise is caused by the partition noise in a two-level system. A capacitive bolometer operating in the paraelectric region near the Curie temperature exhibited a very low noise equivalent power which is comparable with that of a pyroelectric detector. It is concluded that an understanding of the fundamental loss mechanisms in ferroelectric pyroelectric detectors is needed before improvement in a materials-limited device detectivity can be attained.

60130 **(CONF-810839—18) Absolute eddy-current measurement of electrical conductivity.** Dodd, C.V.; Deeds, W.E. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE82020916.

From AF/DARPA review of progress in quantitative NDE; Boulder, CO, USA (2 Aug 1981).

By a through-transmission technique, absolute eddy-current measurements can be made of electrical conductivity. The through-transmission technique induces current in the same directions as does the regular eddy-current test, and the primary standard is small enough to be carried into the field. The measured magnitude and phase shifts can be compared with calculations based on theoretical analysis and computer programs written in the late 1969s. A careful analysis of errors caused by variations in the coil and sample dimensions, edge effects, and misalignment of the coils has been performed by computer calculations and dimensional analysis. The experimental equipment has the sensitivity and stability to measure the conductivity to within 0.05%, and measurements on samples compared with dc standards have given errors of less than 0.5%.

60131 **(HEDL-SA—2650) Thermal NDE method for thermal spray coatings.** Green, D.R.; Schmeller, M.D.; Sulit, R.A. (Hanford Engineering Development Lab., Richland, WA (USA); Puget Sound Naval Shipyard, Bremerton, WA (USA); Naval Sea Systems Command, Washington, DC (USA)). 1982. Contract AC06-76FF02170. 7p. (CONF-820926—3). NTIS, PC A02/MF A01. Order Number DE82020641.

From Marine Technology Society and Geological Society of America conference on oceans; Washington, DC, USA (20 Sep 1982).

This paper describes a feasibility demonstration of a thermal scanning NDE system for thermal spray coatings. Non-bonds were detected between several types of coatings and their substrates. Aluminum anti-skid coatings having very rough surfaces were included. A technique for producing known non-bond areas for calibrating and demonstrating NDE methods was developed.

60132 (INIS-mf—6854, pp vp) **Applications of proton magnetometer and its analysis using multipole approximation.** Liong, T.H. (Bandung Inst. of Tech. (Indonesia). Physics Dept.). 1981. (In Indonesian). Dep. NTIS (US Sales Only).

From 8. national symposium on physics; Jogyakarta, Indonesia (1 Jan 1980).

The working principle of proton magnetometer and data analysis using monopole and dipole approximations are reviewed. Its extension using multipole approximation is discussed. (author).

60133 (INIS-SU—74, pp 151-154) **Method and device for measuring coincidence of boundaries of light and radiation fields.** Kuptsov, E.M.; Pereskokov, Yu.M. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Technique permitting measurement of dimensions of light field and radiation field by means of one detector and unified equipment as well as to determine coincidence of boundaries and central axes of both fields with 0.1 mm accuracy is developed to increase accuracy and provide fast response of radiation field measurements. Measurements of illumination and radiation intensities were conducted by means the PD-9K photodiode and a direct current amplifier with parallel 100%-negative feedback. During operation with radiation the photodiode was closed by light-resistant tissue-equivalent cap and during measurement of illumination intensity - by a diaphragm with 1-2 mm diameter. The photodiode moved along the main axes of the field by means of a mechanism with remote control.

60134 (INIS-SU—103, pp 76-80) **Para-mode sinusoidal generator with the self-symmetrization for quadrupole mass spectrometers.** Borodin, S.M.; Evstifeev, A.A.; Shobotenko, S.A. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

The sinusoidal high frequency generator (HFG) with a para-mode output intended for joint operation with the quadrupole mass spectrometer (QMS) is described. It is known that the absolute resolution of the mass spectrometer is determined by electric symmetry of both HFG outputs in relation to zero potential. In order to obtain the output voltage disbalance not higher than 10^{-3} it is suggested to use HFG with self-symmetrization. In this HFG scheme the summing amplifier in the negative feedback circuit is applied. The analysis of HFG operation with symmetrization has shown that parallel to output voltage disbalance decrease, an additional disbalance caused by the summing up amplifier resistor unequality arises. To compensate this additional disbalance a fine-tuned resistor is connected in series with one of the summing amplifier resistors.

60135 (INIS-SU—103, pp 32-39) **Features of application of the integrated operational amplifiers in the electrometric equipment.** Sikolenko, S.F. 1980. (In Russian). NTIS (US Sales Only), PC A06/MF A01.

In Nuclear electronics. Issue 11. Theory and design of electronic equipment of physical experiment.

Errors of electrometers constructed at differential operational amplifiers are under consideration. Sensitivity and speed of operation of electrometers depending on the method of feedback signal transmission are analyzed. It has been found that the limit electrometer sensitivity on the operational amplifier with a high gain is independent of the feedback signal transmission method. Electrometers constructed at the integrated operational amplifiers enable to measure currents in the order of 10^{-10}-10^{-11} A. The electrometer speed of response are also independent on the method of feedback signal transmission if the source capacity C=0. In the case C not equal to 0 the electrometer with the parallel feedback exceeds the dectrometer with the serial feedback according to speed of operation.

60136 **(INP—1078/PS) General theory of detection of signal induced in vibrating magnetometer.** Pacyna, A.W. (Institute of Nuclear Physics, Krakow (Poland)). 1980. 33p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702418.

Assuming the point dipole approximation only and making use of the vectorial notation, signal (EMF) induced in a single-turn pick-up coil of the vibrating magnetometer are calculated for the case of any orientation of the coil, of vibration axis and of the magnetic moment of the sample. On the basis of formula obtained, three types of measurement geometries have been distinquished and for these the qualitative analysis is made.

60137 (KFTI—78-46, pp 65-67) **Some mass-spectrometric systems with seven zero-points.** Korochkin, A.M.; Trubachev, G.M. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1978. (In Russian). Dep. NTIS (US Sales Only).

In Technique of physical experiment.

A two-cascade system of double focusing in angles and energies is considered. Both cascades are symmetric, the first one is a sector magnetic analyzer with a uniform field and direct beam inlet and outlet. The values of boundary curvature radii of the magnetic analyzer and condensator plate end, the presence of which turns the four most important aberration coefficients into zero, are determined for the case when a toroidal condensator is the second cascade. The ratio between the sector angles of both cascades when the fifth aberration coefficient turns into zero are found. All this has resulted in a system with seven zeros with respect to focusing in angles and energies.

60138 **(LBL—14714) Digital neutron radiography using plane converters with multiwire proportional chambers.** Kaplan, S.N.; Director, B.A.; Perez-Mendez, V.; Valentine, K.H. (Lawrence Berkeley Lab., CA (USA)). Dec 1981. Contract AC03-76SF00098. 9p. (CONF-811215—10). NTIS, PC A02/MF A01. Order Number DE82020294.

From World conference on neutron radiography; San Diego, CA, USA (7 Dec 1981).

The work described here was completed more than three years ago, and represents, in large part the PhD and MS thesis research of two of the present authors. Much of it has been reported previously elsewhere. It constitutes an effort to develop and study a moderately low cost, moderate resolution, high sensitivity, on-line method for digital neutron radiography, intended for use where neutron fluence was limited by source strength, or received dose. The basic imaging system consisted of a position-sensitive gas proportional chamber together with its associated imaging electronics, and a plane neutron converter. Enriched-boron, gadolinium, and polyethylene (for fast neutrons) converters were analyzed and tested. Some work was done on digital data enhancement, and efforts to improve spatial resolution included pressurizing the proportional-chamber gas to reduce the track lengths of the neutron-interaction products.

60139 **(RFP—3290) Automated balance for determining true mass.** Meyer, J.E. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 8 Aug 1982. Contract AC04-76DP03533. 28p. NTIS, PC A03/MF A01. Order Number DE82021737.

An automated weighing system utilizing a precision electronic balance and a small desktop computer is described. An example of a computer program demonstrating some of the capabilities attainable with this system is included. The program demonstrates a substitution weighing technique with true mass determination for the object being weighed.

60140 **(SAND—82-1943C) Measurement standards in an R and D environment.** Franzak, E.G. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-821028—1). NTIS, PC A02/MF A01. Order Number DE82020405.

From National conference of Standards Laboratories; Gaithersburg, MD, USA (4 Oct 1982).

Implementation of a standards and calibration program in an R and D laboratory is significantly different from implementation of such a program in a production complex. This paper addresses some of those differences and discusses techniques which have proven useful in operating a calibration program in an R and D environment.

60141 (INIS-mf—7117, pp v) **Construction of a microsusceptometer according to B.B. Cunningham.** Weigel, F.; Wishnevsky, V.; Lehmann, T.; Schuster, W. (Muenchen Univ. (Germany, F.R.). Radiochemische Abt.). [nd]. (In German). Dep. NTIS (US Sales Only).

In Status report 1980 of the scientific sector 'Nuclear Chemistry' promoted by the BMFT (Federal Ministry for Research and Technology).

The construction of a quarz pendulum microsusceptometer according to B.B. Cunningham is described which is suitable for measuring specific magnetic susceptibilities of actinide metals and its compounds. The susceptometer is especially constructed for the use in extremely small substance amounts (upto about 20 nanogram substance). It opens up especially the possibility of investigating samples of transcurium elements as well as anisotropic susceptibility measurements. (orig.).

4404 Well Logging Instrumentation

REFER ALSO TO CITATION(S) 59117

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 59844, 59925

60142 **(MHSMP—82-25) Analysis of chloronitrobenzenes in TATB.** Schaffer, C.L.; Quinlin, W.T. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Aug 1982. Contract AC04-76DP00487. 4p. NTIS, PC A02/MF A01. Order Number DE82021987.

An analytical method has been developed for chloronitrobenzene impurities in TATB which involves isolation of the impurities by extraction and quantitation by gas chromatography. The precision of the method is +- 0.001% from the same extract and +- 0.004% from multiple extraction at a 95% confidence level. The method does not measure chloronitrobenzenes entrapped within TATB crystals.

60143 **(SAND—82-1841C) Large scale hydrogen-air detonations.** Benedick, W.B.; Lee, J.H.; Knystautas, R.; Guirao, C.M. (Sandia National Labs., Albuquerque, NM (USA); McGill Univ., Montreal, Quebec (Canada)). 1982. Contract AC04-76DP00789. 7p. (CONF-821026—1). NTIS, PC A02/MF A01. Order Number DE82020353.

From 2. international workshop on the impact of hydrogen on water reactor safety; Albuquerque, NM, USA (3 Oct 1982).

The rich and lean detonation limits of hydrogen-air mixtures are dependent upon critical dimensions of the detonation channel. Extrapolation of laboratory scale hydrogen-air detonations, verified by some large scale detonations, increases confidence for further extrapolation to the very large dimensions associated with reactor containment buildings. We have complemented the laboratory scale experiments performed at McGill University with large scale ex-

periments. Both rich and lean hydrogen-air mixtures were confined in thin-wall (100 μ m) transparent polyethylene envelopes to provide minimum lateral support. The diameter of the envelopes ranged from 0.75 to about 2 m depending upon the mixture under study. For the critical tube diameter experiments, the polyethylene tube was attached to a steel tube which was generally smaller than the polyethylene tube. High explosive was used to launch a detonation in the steel tube, the emergent detonation wave then propagated into a larger diameter plastic envelope. The experimental techniques used to perform these large scale detonation experiments are described and some high speed cinematographic records of the experiments are shown.

4502 Nuclear

REFER ALSO TO CITATION(S) 59182, 59924

60144 **(LA—9369-MS) Air transport in connection with the Hiroshima-Nagasaki dose-reevaluation effort.** Estes, G.P.; Little, R.C.; Seamon, R.E.; Soran, P.D. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 72p. NTIS, PC A04/MF A01. Order Number DE82021848.

Portions of document are illegible.

During calendar year 1981 one man-year of effort on the part of the Monte Carlo Group at Los Alamos was committed to the renormalization of cross sections for use in air-over-ground calculations. Calculations of the Army Pulsed Reactor Division (APRD) measurements, the Oak Ridge National Laboratory (ORNL) broomstick experiments, and the Lawrence Livermore National Laboratory (LLNL) pulsed sphere experiments carried out with the view to renormalizing the air transport cross sections are described in this report. On the basis of our calculations, it is impossible to conclude that there is anything grossly in error with the air transport cross sections.

60145 **(LA-UR—82-2308) Hydrofracture from a growing cavity.** Kunkle, T.D.; Travis, B.J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 25p. (CONF-810884—4). NTIS, PC A02/MF A01. Order Number DE82021767.

From Monterey containment symposium; Monterey, CA, USA (26 Aug 1981).

The Los Alamos KRAK code has been used to calculate fracturing away from the growing cavity formed by a nuclear detonation. In the 55 ms before rebound, the stress in the surrounding rock is decreasing, and conditions for fracture propagation are good. During this interval, hydrofractures driven by the high-temperature, high-pressure gases within the cavity grow readily. Fracture growth slows when the stress increases as the residual hoop is formed during rebound. However, cracks are found to escape through the residual stress field. The effects of initial conditions and zoning on the numerical calculations are discussed, and the roles of the media saturation and roughness are briefly considered. The largest uncertainty in these calculations is the manner in which the effective pressure used in computing crack widths is extended into the cavity region. Because the present calculations have been done using a very conservative scheme, actual fractures should grow even more readily. We conclude that hydrofracture is an important, if not dominant, process in transporting mass and energy out of a cavity formed by a nuclear detonation.

60146 **(SAND—82-1837C) Kauai Test Facility.** Hay, R.G. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-821017—4). NTIS, PC A02/MF A01. Order Number DE82020035.

From 6. AIAA sounding rocket conference; Orlando, FL, USA (26 Oct 1982).

The Kauai Test Facility (KTF) is a Department of Energy rocket launch facility operated by Sandia National Laboratories. Originally it was constructed in support of the high altitude atmospheric nuclear test phase of operation Dominic in the early 1960's. Later, the facility went through extensive improvement and modernization to become an integral part of the Safeguard C readiness to resume nuclear testing program. Since its inception and build up, in the decade of the sixties and the subsequent upgrades of the seventies, range test activities have shifted from full scale test to emphasis on research and development of materials and components, and to making high altitude scientific measurements. Primarily, the facility is intended to be utilized in support of development programs at the DOE weapons laboratories, however, other organizations may make use of the facility on a non-interface basis. The physical components at KTF and their operation are described.

60147 **(SAND—82-8232) Proposal for providing integrated CAD/CAM in the DOE/NWC.** Crowe, R.A.; Elliott, R.L.; Jones, J.F.; Kelly, J.C. (Sandia National Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 42p. NTIS, PC A03/MF A01. Order Number DE82019995.

This is a proposal for providing integrated Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) in the Department of Energy/Nuclear Weapons Complex (DOE/NWC). This plan was developed under the premise that commitment to this CAD/CAM Integration Plan will lead to improved use of DOE/NWC's limited resources. The Integration Plan consists of the development of a Design with recommended action, followed by implementation and maintenance plans. This report proposes a methodology for the development of the design.

4503 Explosion Detection

REFER ALSO TO CITATION(S) 60297

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

REFER ALSO TO CITATION(S) 59465, 60157

60148 **(INIS-mf—7052) Gas exchange between atmosphere and ocean. Field measurements by the radon method.** Kromer, B. (Heidelberg Univ. (Germany, F.R.). Naturwissenschaftliche Gesamtfakultaet). 1979. 105p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780663.

Thesis.

The gas exchange rate and its dependance on wind velocity are determined in field measurements using the radon method. The method makes use of the fact that there is a radon deficit in the mixed layer as against radioactive equilibrium with radium. The radon method is described after a review of theoretical assumptions on gas exchange and laboratory measurements, and the complete radon balance is derived. The bilinear wind function is chosen as a functional type of relationship between gas exchange rate and wind velocity. This bilinear wind function is considered to be the best representation so far of the gas transfer rate in dependence of wind velocity.

60149 **(PB—82-193061) Geophysical Monitoring for Climatic Change number 9. Summary report 1980.** DeLuisi, J.J. (National Oceanic and Atmospheric Administration, Boulder, CO (USA). Air Resources Lab.). Dec 1981. 174p. NTIS, PC A08/MF A01.

This document presents a summary of the research operations and accomplishments by the Geophysical Monitoring for Climatic Change (GMCC) program and by outside investigators working cooperatively with GMCC in 1980. It includes descriptions of management and operations at GMCC's four baseline sites, scientific data from the measurement projects, conclusions from analyses of data and recent basic research achievements. The four observatories are located in Barrow, Alaska; Mauna Loa, Hawaii; American Samoa; and South Pole.

60150 **Is atmospheric particulate matter inhibiting marine primary productivity?.** Hardy, J.T.; Crecelius, E.A. (Marine Research Lab., Sequim, WA). *Environmental Science and Technology;* **15**: 1103-1105(Sep 1981). Contract AC06-76RL01830.

Present deposition rates of atmospheric particulate matter do not appear great enough to inhibit marine primary productivity except, perhaps, at the sea-surface microlayer. Milligram/liter quantities of air particulate matter added to seawater result in an exponential reduction in photosynthetic ^{14}C assimilation of natural marine phytoplankton populations. Urban particles are 6 times more toxic than rural particles. The ratios of soluble trace elements from equal amounts of urban (Seattle) to rural (Quillayute) atmospheric particles are as follows: As, 112; Br, 6.4; Cr, 3.4; Cu, 3.7; Ni, 3.0; Pb, 36; V, 2.7; and Zn, 2.2.

60151 **An alternate pseudospectral model for pollutant transport, diffusion and deposition in the atmosphere.** Lee, H.N. (Univ. of Utah, Salt Lake City). *Atmospheric Environment;* **15**: No. 6, 1017-1024(1981). Contract AC02-76EV02455.

A numerical model of atmospheric transport, diffusion and deposition has been developed for pollutants which are emitted into atmospheric boundary layer with upper boundary condition at the inversion layer and lower boundary condition at the surface. The numerical schemes used in the model are derived from the use of finite Fourier transform. However, instead of using FFT, alternate pseudospectral schemes for evaluations of space derivative terms in the model equation with the setting velocity are presented. The model involves the evaluation of a polynomial function for non-periodic boundary conditions in order to apply the alternate pseudospectral schemes to the periodic function. The numerical results were discussed for different profiles of vertical eddy diffusivity and for different absorptive deposition conditions at the ground.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 59141, 59179, 59632, 59829, 59963, 60196, 60284

60152 **Sulfur chemistry in a copper smelter plume.** Eatough, D.J.; Christensen, J.J.; Hill, M.W.; Major, T.D.; Mangelson, N.F.; Post, M.E.; Ryder, J.F.; Hansen, L.D. (Brigham Young Univ., Provo, UT). *Atmospheric Environment;* **16**: No. 5, 1001-1015([nd]). Contract AC02-76EV02988.

Sulfur transformation chemistry was studied in the plume of the Utah smelter of Kennecott Copper Corporation from April to October 1977. Samples were taken at up to four locations from 4 to 60 km from the stacks. Data collected at each station included: SO_2 concentration, low-volume collected total particulate matter, high-volume collected size fractionated particulate matter, wind velocity and direction, temperature, and relative humidity.The $SO_2(g)$-sulfate conversion process in the plume is described by a mechanism which is first order in $SO_2(g)$. Equations are derived describing sulfur chemistry when both S(IV) and sulfate formation occur in a plume. The formation of sulfate results primarily in the formation of <0.5 μm particulates. The formation process is not correlated with plume expansion, particulate acidity, metal content, or S(IV) species. Due to meteorological restrictions on sampling, data were collected only during periods of maximum insolation. The formation of sulfate from $SO_2(g)$ in the plume during periods of high insolation is temperature dependent with an apparent activation energy of 16.6 +/- 1.4 kcal mol^{-1} and k_1 value of 0.039 h^{-1} at 25°C.

60153 (GSF-OE—599, pp 76-84) **Structure and photochemical stability of environmental chemicals.** Parlar, H.; Mansour, M.; Hustert, K.; Baumann, R. Mar 1981. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

From Colloquium 1980 of the GSF Institut fuer Oekologische Chemie; Neuherberg, Germany, F.R. (11 Nov 1980).

The photophysical and photochemical reaction possibilities of environmental pollutants (e.g. chlorinated benzenes, triazonium herbicides) - under simulated natural, under tropospherical conditions, in the excited state, intramolecular and intermolecular reactions, the behaviour under compared natural and simulated environmental conditions, according to photochemical and thermal decomposibility (UV-radiation, reactive species $NO_2, O_2, {}^3O_2$) are studied.

60154 **(LBL—13678) Comparison of alternate ventilation strategies.** Sherman, M.H.; Grimsrud, D.T. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 24p. (CONF-820939—1). NTIS, PC A02/MF A01. Order Number DE82020314.

From 3. Air Infiltration Centre conference on energy efficient domestic ventilation systems for achieving acceptable indoor air quality; London, UK (20 Sep 1982).

Portions of document are illegible.

Unacceptable air quality inside structures often results when residences are built to stringent air-tightness standards. Most of the effort in controlling indoor contaminants in residences has been concentrated on finding the most effective means of increasing ventilation while incurring the smallest energy load. Three alternative mechanical ventilation strategies for increasing total ventilation are examined. A comparison is made of a balanced (mechanical) air-to-air system, an unbalanced (mechanical) exhaust system, and a ventilation stack with completely natural ventilation. The exhaust system will be subdivided into three systems that treat heat loss through the mechanical system differently.

60155 **(PB—82-182098) Atmosphere-biosphere interactions: toward a better understanding of the ecological consequences of fossil fuel combustion. Final report 15 Sep 78-31 Aug 81.** (National Academy of Sciences - National Research Council, Washington, DC (USA)). 1981. 280p. NTIS, PC A13/MF A01.

The Committee focused its attention on the following pollutants: sulfur and nitrogen compounds, trace metals, and organic substances. The Committee noted that understanding of patterns of emission, transport, deposition, and biological effects of these pollutants is incomplete, and they provided a preliminary guideline for the sorts of integrated research needed. After discussing biogenic emissions of the substances of concern and the magnitude and form of anthropogenic emissions, the Committee described in detail atmospheric transport and deposition processes and biological accumulation. A guide was developed to predicting consequences of continued or accelerated pollution, and a case history was given of effects of acid rain. The conclusion was reached that increased scientific effort is needed in two critical areas: long-term monitoring and forecasting of future effects of these pollutants, and ecotoxicology. The Committee recommended that U.S. agencies provide funding for the needed scientific effort and in particular for the establishment of graduate training programs in ecotoxicology.

60156 **(PB—82-185505) Estimating exceedances and design values from urban ozone monitoring network data. Final report.** Ludwig, F.L.; Javitz, H.S.; Valdes, A.; Maxwell, C.; Patterson, R. (SRI International, Menlo Park, CA (USA)). Nov 1981. 129p. NTIS, PC A07/MF A01.

This report presents the concepts of design value and expected number of exceedances (of the 120-ppb standard) as defined by the U.S. Environmental Protection Agency (EPA) for a single monitoring site and extends those concepts to a network of sites describing conditions throughout an extended urban area. Using those definitions, methods are described for calculating values from observed data. The methods apply nonlinear interpolation and Monte Carlo simulations (based on empirically derived conditional-probability distributions) to locate areas where the greatest numbers of exceedances and highest design values are expected and to calculate the values in those areas. The methods were applied to extensive data bases collected during special monitoring programs in four different urban areas: Houston, Los Angeles, Philadelphia, and St. Louis. The appendixes to the report provide all the necessary instructions (including computer programs) for applying the methods. The instructions encompass: acquisition, screening, and preprocessing of data; application of methodologies and computer programs for estimating design values and number of exceedances; determination of the origins and concentrations of background ozone entering the city; and design of supplemental monitoring programs.

60157 **(PB—82-188012) Fiscal year 1980 summary report of NOAA meteorology laboratory support to the Environmental Protection Agency. Technical memo.** Viebrock, H.J. (National Oceanic and Atmospheric Administration, Silver Spring, MD (USA). Air Resources Lab.). Jun 1981. 49p. (NOAA-TM-ERL-ARL—107). NTIS, PC A03/MF A01.

The primary research effort was in the development and evaluation of air quality simulation models using numerical and physical techniques supported by field studies. Work on the description and modeling of the planetary boundary layer continued. Major emphasis was on modeling photochemical oxidant dispersion and dispersion in complex terrain. In addition, climatic studies were conducted, including the analyses of the relationships between pollutant concentrations and meteorological parameters. A flow visualization field study of small hill impaction was conducted at Cinder Cone Butte, Idaho as part of the study of dispersion in complex terrain. This was complemented by towing tank studies in the Fluid Modeling Facility. The second Northeast Regional Oxidant Study field program was conducted during July-August 1980 to investigate physical and chemical processes important to long-range transport of oxidants and oxidant precursors. Four photochemical air quality models were evaluated using data for ten carefully selected high ozone days from the Regional Air Pollution Study in St. Louis. The European Model for Air Pollution (EURMAP), which predicts SO2 and SO4 concentrations and deposition rates as well as interregional sulfur transport, was adapted for use over eastern North America (ENAMAP).

60158 **(PB—82-188830) Smoke management - a workbook for balancing air quality and land management goals. Final report.** (Forest Service, Washington, DC (USA)). 10 Jan 1982. 125p. NTIS, PC A06/MF A01.

A process is given for balancing air quality and land management goals through smoke management. The process has application wherever land management open burning has the potential to affect air quality, or wherever air quality restrictions may affect the use of fire as a land management practice. Primary focus of the process is upon confirmation of related public and technical issues, then upon developing issue-resolving criteria. This leads to development and evaluation of alternatives. Two are emphasized. One is increased utilization of residues in place of burning. The other emphasized alternative is scheduling of open burning to meet conditions specified for maintaining downwind concentrations of emissions to acceptable levels. Scheduling may also be employed to favor visibility protection and enhancement. Process supporting technical appendices cover development and evaluation of a smoke management program, predicting downwind concentrations, and determining visibility protection needs. Selected references and a glossary are provided.

60159 **(TVA/ONR/ARP—82/12) Interregional transport and Lagrangian measurements over the southern United States, April 1980.** Reisinger, L.M. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Office of Natural Resources). May 1982. 72p. NTIS, PC A04/MF A01. Order Number DE82904671.

During April 1980, the Tennessee Valley Authority conducted an interregional long-range transport (LRT) field intensive using airborne and ground-based sampling. Data were gathered on 15 days over a wide region of the southeastern United States from the Ohio River Valley to the Louisiana Gulf Coast. Data on five of these days are of particular interest because Lagrangian or near Lagrangian measurements were made. For each of the five events, synoptic meteorology, air parcel and/or tetroon trajectories, source regions, and pollutant concentrations and flux were analyzed and are presented herein.

60160 (UCRL—50007-81, pp 2-4) **Performance and evaluation of charcoal adsorbers.** Swearengen, P.M.; Johnson, J.S.; Harder, C.A. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

Charcoal adsorbers are used extensively in air-cleaning systems for removal of toxic/carcinogenic gases and vapors. Such adsorbers are presently in use within several fume hood and glove box systems at LLNL's Chemistry and Biomedical facilities. A current project of the Safety Science Group is to establish a test procedure that will provide an in-place field test for measurement of charcoal-adsorber service life (residual adsorption capacity, RAC). The experimental design of this project is twofold. First, a parallel sampling system utilizing removable miniature charcoal cartridges has been designed and will be installed on an existing HEPA filter/charcoal adsorber unit located on an organic synthesis fume hood. Second, a series of laboratory experiments will be performed to measure charcoal-adsorber performance under controlled conditions. Laboratory tests will then be conducted on the miniature charcoal cartridges placed in service previously. It is believed that this approach will provide a realistic body of data from both simulated and real conditions to establish the basis for subsequent in-place field testing.

60161 (UCRL—50007-81, pp 5-8) **Asbestos ceiling insulation: evaluation of dust levels and control alternatives.** Harder, C.A.; Schweickert, G.J. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

Although the concern about asbestos-related health hazards is not new, there has been recent media attention on the possible risks from sprayed-on insulation in schools and office buildings. Previously focus had been on workers in the occupationally exposed trades - plumbers, insulators, and construction workers. The inclusion of office workers and school-age children within the category of individuals at risk has created a great deal of concern on their part. At LLNL asbestos was used as pipe insulation in the older barracks-type buildings and is gradually being replaced whenever mechanical work is done on these systems. It is also found in one older building (Bldg. 131), where asbestos was used as a sprayed form of insulation. Over the past 10 years Hazards Control has monitored the condition of this insulation to determine if there is any risk to building occupants and, if so, what actions would be necessary to protect their health. This article summarizes the activities and conclusions of our current investigation. Four methods of handling existing asbestos insulation are comparatively evaluated.

60162 (UCRL—50007-81, pp 13-16) **Computerized small-scale air filter test facility.** Biermann, A.H. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

A unique air filter test facility built at LLNL is being used for conducting filter research and development. The unique features of this facility include a fully computerized diagnostic system and filter test apparati that can evaluate a wide range of filters ranging from small hand sheets and filter units to full-scale commercial units. Filter experiments that used to take a day, without computer interfacing and data reduction, can now be done within minutes.

60163 (UCRL—50007-81, pp 34-36) **Particle size for greatest penetration of HEPA filters.** da Roza, R.A. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

High-efficiency particulate air (HEPA) filters used in the nuclear industry are pretested for efficiency using a monodispersed DOP aerosol of 0.3-μm diam. This testing is based on the assumption that 0.3 μm-diam particles are the most penetrating size for HEPA filters. However, if this is not the size of maximum penetration (SOMP), then what is and how much greater is the penetration are questions that need to be answered for an accurate evaluation of environmental releases of hazardous materials. To answer these questions, the literature was reviewed and experimental data was compared with theory.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 60081, 60271

60164 (CONF-820729—2) Validation of the atmospheric transport model: comparison of observed krypton-85 concentrations with those computed using a Gaussian plume model. Raridon, R.J.; Murphy, B.D. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE82018163.

From Summer computer simulation conference; Denver, CO, USA (19 Jul 1982).

Thirty monthly average ^{85}Kr concentrations measured at 13 sampling locations between 25 and 150 km from a quasi-continuous point source were used in a validation study of the Atmospheric Transport Model for Toxic Substances (ATM-TOX). Although the computed values tended to overestimate, more than 60% of them fell within a factor of 2 of the observed concentrations.

60165 (ENICO—1002) RSAC-3: radiological-safety-analysis computer program. Wenzel, D.R. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). Apr 1982. Contract AC07-79ID01675. 171p. NTIS PCE06/MF A01. Order Number DE82021548.

Includes 1 sheet of 48x reduction microfiche.

This report is a User's Manual for RSAC-3, the third revision of the Radiological Safety Analysis Computer Program. The program is capable of calculating fission product buildup and decay; meteorological diffusion and/or depletion values; and individual or population doses resulting from inhalation, deposition or ingestion of, or direct cloud gamma exposure to radionuclides released to the environment. Included in this report are a discussion of program capabilities and mathematical models employed within the code, user input instructions and guidelines, sample problems, listings of constants used in the code, a listing of the program, and appropriate references.

60166 (INIS-SU—86, pp 216-217) Artifical radionuclides are a new anthropogeneous factor in biosphere. Gedeonov, L.I.; Kuznetsov, Yu.V.; Lazarev, L.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

60167 (LBL—10775) Radon and its daughters in energy-efficient buildings. Nero, A.V.; Boegel, M.L.; Hollowell, C.D.; Ingersoll, J.G.; Nazaroff, W.W.; Revzan, K.L. (Lawrence Berkeley Lab., CA (USA)). Nov 1980. Contract AC03-76SF00098. 9p. (CONF-810153—2). NTIS, PC A02/MF A01. Order Number DE82020291.

From 2. special symposium on natural radiation environment; Bombay, India (19 Jan 1981).

Portions of document are illegible.

Our group has been carrying out work on several aspects of radon and its daughters indoors. We have measured radon emanation rates and radionuclide concentrations in building materials, performed surveys of radon and daughter concentrations in residences, begun to examine control techniques and strategies, and devoted significant efforts to instrumentation developments. To more completely characterize radon and its daughters indoors, more substantial efforts are needed on the questions of geologic distribution of radon, transport into structures, daughter behavior indoors, and instrument response under various conditions.

60168 (NUREG/CR—2560) Quality assurance for measurements of ionizing radiation. Annual report 15 Sep 80-30 Sep 81. Eisenhower, E.H.; Ehrlich, M.; Loftus, T.P.; Hutchinson, J.M.R. (National Bureau of Standards, Washington, DC (USA)). Mar 1982. 66p. NTIS, PC A04/MF A01.

This report describes results of the first year of a program that will enable the Nuclear Regulatory Commission to improve, demonstrate, and document traceability of its measurements to the national physical measurement standards for ionizing radiation. The principal actions being taken are: (1) characterization of the response of thermoluminescence dosimetry systems used for routine surveillance of nuclear facilities; (2) type testing and characterization of portable survey instruments; and (3) implementation of routine quality assurance services which will demonstrate that regulatory measurements are sufficiently consistent (in agreement) with national measurement standards. During the year, some tests of the TLD system were performed as specified in American National Standard N545-1975, specifically uniformity, reproducibility, dependence of exposure interpretation on the length of the field cycle, energy dependence, light dependence, and moisture dependence. The energy dependence of five portable survey instruments was determined for exposure to photon radiation, and a chamber for exposure to gaseous sources of beta radiation was designed and partly built. The four laboratories which calibrate portable survey instruments for NRC inspectors were invited to participate in measurement quality assurance interactions with NBS, and all expressed a desire to do so.

60169 (UCRL—87070) Use of principal components analysis and three-dimensional atmospheric-transport models for reactor-consequence evaluation. Gudiksen, P.H.; Walton, J.J.; Alpert, D.J.; Johnson, J.D. (Lawrence Livermore National Lab., CA (USA); Sandia National Labs., Albuquerque, NM (USA)). Jan 1982. Contract W-7405-ENG-48. 18p. (CONF-820802—3). NTIS, PC A02/MF A01. Order Number DE82010244.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

This work explores the use of principal components analysis coupled to three-dimensional atmospheric transport and dispersion models for evaluating the environmental consequences of reactor accidents. This permits the inclusion of meteorological data from multiple sites and the effects of topography in the consequence evaluation; features not normally included in such analyses. The technique identifies prevailing regional wind patterns and their frequencies for use in the transport and dispersion calculations. Analysis of a hypothetical accident scenario involving a release of radioactivity from a reactor situated in a river valley indicated the technique is quite useful whenever recurring wind patterns exist, as is often the case in complex terrain situations. Considerable differences were revealed in a comparison with results obtained from a more conventional Gaussian plume model using only the reactor site meteorology and no topographic effects.

5006 Regulations

REFER ALSO TO CITATION(S) 59648, 59649, 59650, 59651, 59652

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

60170 (ORNL—5868) Physical characteristics of soils of the southern region: Fullerton and Sequoia series. Luxmoore, R.J. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 86p. NTIS, PC A05/MF A01. Order Number DE82020489.

Records of hydrologic measurements taken on two soil profiles on the Oak Ridge Reservation in eastern Tennessee are documented. Soil water content estimated from neutron probe measurements and matric potential measured with tensiometers provided in situ data for calculation of retention and hydraulic conductivity characteristics of the dominant horizons in the profiles. Retention characteristics determined on soil cores showed significant differences from field results that were attributed to entrapped air in field soils and spatial heterogeneity of soil physical properties. Tensiometer data did not provide consistent hydraulic gradient data, and conductivity calculations were made assuming a unit hydraulic gradient. Both soils were well drained and exhibited maximum conductivity values in excess of 1 m/d.

60171 **(ORNL/TM—6803/S3) White-tailed deer (Odocoileus virginianus) on the Department of Energy's Oak Ridge Reservation: 1980 status report.** Story, J.D.; Kitchings, J.T. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 38p. NTIS, PC A03/MF A01. Order Number DE82020479.

Ninety-eight white-tailed deer (Odocoileus virginianus) were killed by vehicles on the Department of Energy's Oak Ridge Reservation during 1980, an increase of twenty-five over 1979. Both spatial and temporal patterns of mortality were similar to those reported previously. November and December were the months when the highest numbers of deer were killed. The sex ratio of road-kills was about 1.1 from January through October but shifted to a high male kill (4.8:1) during November and December, presumably the result of the rutting season. Reproductive data collected from does indicated that breeding occurred as early as October 20 and as late as December 21. Records kept on rutting condition in bucks indicated a breeding season from October through January; antlers were shed from January through April with the peak of shedding activity occurring in March. Postmortem examination of deer revealed a good general condition of the animals with only a few abnormalities or indications of sickness or disease. Abomasal parasite counts indicate that Reservation deer population has reached optimum density. Other parasites found include brainworms, body worms, and botfly larvae; papillomas were observed in two deer during 1980. Data from heart girth and weight measurements were presented and compared to similar data from elsewhere in the Southeastern United States.

60172 **(ORNL/TM—7751) Resilience and inertia in model ecosystems: tests of some hypotheses.** Turner, M.A.; DeAngelis, D.L. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 66p. NTIS, PC A04/MF A01. Order Number DE82020487.

Resilience is defined as the speed with which a system returns to equilibrium following a perturbation, and resistance is defined as a measure of the extent to which a given compartment, or set of compartments, resists change. Resilience and resistance properties were investigated for both food web energy models and nutrient cycling models. Several indices of resilience, including the average transit time through the system, were examined. A hypothesis concerning the relationship between the transit time and the eigenvalues of the perturbation matrix is tested. Transit time is also used to investigate the fate of toxic materials in a system, and to determine peak loads of toxic materials in the compartments of a system.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 59144, 60284

60173 (GSF-OE—599, pp 139-156) **Experience gained with ecotoxicological profile analysis and the significance of the data obtained.** Freitag, D.; Geyer, H.; Kotzias, D.; Kraus, A.; Viswanathan, R. Mar 1981. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

From Colloquium 1980 of the GSF Institut fuer Oekologische Chemie; Neuherberg, Germany, F.R. (11 Nov 1980).

The main object of the test system of the ecotoxicological profile analysis is to provide experimental data on the accumulation and decomposition in the environment. As there are no recognized tests which can be quantitatively transfered to the true environment, simplified experimental methods have been worked out and applied, as far as possible, taking into account that the data obtained can only be comparitively used and evaluated. The following test systems were applied: rat test (oral administration of test substances with probang), fish test (tracing of chemicals in water on orfes), seaweed test (24 h incubation of suspensious of chlorella fusca with the test substances), photomineralization test (with ^{14}C-labelled substances in a microphoto reactor), activated sludge test (in-vitro investigations with activated sludge from a communal sewage plant) and waste composting (in a simulation apparatus).

60174 (GSF-OE—599, pp 157-160) **Experience gained with a soil degradation test.** Vockel, D. Mar 1981. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

From Colloquium 1980 of the GSF Institut fuer Oekologische Chemie; Neuherberg, Germany, F.R. (11 Nov 1980).

A simple, cheap short-term soil test is to be developed for the ecotoxicological profile analysis test system. This test should enable aerobic as well as anaerobe incubation. The test duration is set to a minimum of 5 days and a maximum of 28 days and the expected results are: Quantitative determination of the mineralization rate and the volatility losses over the whole test period. Furthermore the conversion rate, quantity of unchanged starting product and the 'non-extractable residues' are to be determined where required.

60175 (GSF-OE—599, pp 161-171) **Short-term tests on the distribution and conversion of environmental chemicals in the plant-soil system and comparison of the results with field tests.** Kloskowski, R.; Scheunert, I.; Korte, F. Mar 1981. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

From Colloquium 1980 of the GSF Institut fuer Oekologische Chemie; Neuherberg, Germany, F.R. (11 Nov 1980).

The test presented in this contribution enables one to make a complete balance of the radioactivity applied including the gaseous products formed by using C-14-labelled compounds. Contrary to other methods described in literature, the test arrangement described here is relatively uncomplicated and conceived for a test period of 7 days, which however does not exclude longer test times. It may be summarized that the test system developed and tested by us is well suited to comparative prediction of the conversion of soils and plants as well as of the volatility from the system. The prediction of the uptake factor is only very conditionally possible taking account of the influences of some important factors which yet require further research.

60176 **(MTR—7006) Environmental impact of polychlorinated biphenyls.** Kornreich, M.; Fuller, B.; Dorigan, J.; Walker, P.; Thomas, L. (Mitre Corp., McLean, VA (USA)). May 1976. Contract AC05-76OR04993. 706p. NTIS, PC A99/MF A01. Order Number DE82020637.

This document assesses the environmental impact of polychlorinated biphenyls (PCBs). The chemical and physical properties of PCBs as well as the implications of these properties for the behavior of PCBs in the environment, are defined. The effects of PCBs on plants, microorganisms, birds, mammals, and humans are described. The possible role of trace contaminants in toxicity of commercial PCB mixtures is evaluated. The entry of PCBs into the environment is discussed in relation to their production, use and disposal. The distribution and fate of PCBs in atmosphere, hydrosphere, and lithosphere and transport of PCBs through the environment are described. Biological accumulation and ecological magnification are described at various trophic levels. The toxic significance of environmental levels of PCBs is assessed.

60177 **(ORNL—5814) MAGIC: a digitization and image-processing program.** Glandon, S.R.; Fields, D.E. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 62p. NTIS, PC A04/MF A01. Order Number DE82020476.

An interactive digitization and image processing program was developed. This program, called MAGIC (Map Analysis and Graph Interpretation Code), features two methods of digitization, a keyboard-controlled cursor and a light pen. Image processing routines include perimeter and area evaluation algorithms and an image overlay algorithm. Several output options are offered, including hardcopy generation and cassette storage of figures. MAGIC has a tutorial introduction, numerous user prompts, and a HELP command for eliciting expanded explanations of commands during program execution. The code has been verified by computing perimeters and areas of regular polygons and by finding areas of selected states. It has also been applied to determination of denuded area associated with strip mine sites in Tennessee and drought-impacted areas within California during 1976 and 1977. MAGIC is written in

Microsoft/Radio Shack Level II BASIC for use in a Radio Shack TRS-80 microcomputer. The code consists of 592 statements and requires at least 32 kilobytes of random access memory in which to execute. A statement-packed version requiring reduced program storage is also presented.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 59287, 59305, 59319, 59320, 60165, 60245, 60271

60178 **(INIS-mf—7044) Monitor of contamination of hands and clothes.** Slezak, V.; Novakova, O.; Fronka, O.; Kos, J.; Smola, J. (Tesla, Premysleni (Czechoslovakia). Vyzkumny Ustav Pristroju Jaderne Techniky). 25 Sep 1981. 68p. (In Czech). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780684.

An instrument was designed for measuring alpha and beta contamination of hands and of beta contamination of clothing and working surfaces. Proportional flow counters and GM counters, respectively, are used as detectors. The design allows simultaneous measurement of the contamination of both hands, this even with low-energy beta radionuclides, such as carbon 14.

60179 (INIS-SU—86, pp 213) **Radiochemical control of natural radionuclides in fertilizers and environmental objects.** Pchelkin, V.A.; Sviderskij, M.F.; Moshchanskaya, N.G.; Myasoedov, B.F.; Novikov, Yu.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

60180 (INIS-SU—86, pp 213-214) **Entering of heavy natural radionuclides into agriculture production during chemization of agriculture.** Grashchenko, S.M.; Strukov, V.N.; Shishkunova, L.V.; Shchebetkovskij, V.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

60181 (INIS-SU—86, pp 215-216) **Content of natural radionuclides of uranium and thorium series in soil and plants in the case of introduction of phosphoric fertilizers under conditions of intensive chemization of agriculture.** Gladkova, K.F.; Drichko, V.F.; Lisachenko, E.P.; Yanishevskij, F.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

60182 (INIS-SU—86, pp 218) **Regularities of interphase distribution of radionuclides in hydrogeological media.** Balukova, V.D.; Kajmin, E.P.; Ushakov, S.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

60183 **(ORNL/TM—8405) ORNL calibrations facility.** Berger, C.D.; Gupton, E.D.; Lane, B.H.; Miller, J.H.; Nichols, S.W. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 38p. NTIS, PC A02/MF A01. Order Number DE82020480.

The ORNL Calibrations Facility is operated by the Instrumentation Group of the Industrial Safety and Applied Health Physics Division. Its primary purpose is to maintain radiation calibration standards for calibration of ORNL health physics instruments and personnel dosimeters. This report includes a discussion of the radioactive sources and ancillary equipment in use and a step-by-step procedure for calibration of those survey instruments and personnel dosimeters in routine use at ORNL.

60184 **(RHO-HS-SR—82-4-P) Rockwell Hanford Operations environmental surveillance. Annual report calendar year 1981.** Conklin, A.W.; Elder, R.E.; Osborne, W.L.; Pisarcik, J.M. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Aug 1982. Contract AC06-77RL01030. 113p. NTIS, PC A06/MF A01. Order Number DE82021929.

This report describes Rockwell's environmental surveillance activities during calendar year 1981. The concentration guides in Table II of DOE Order 5480.1, Chapter XI represent maximum permissible concentrations for general population exposure on an annual basis assuming continuous exposure (DOE, 1981). Radionuclide concentrations in the air and surface water disposal sites are compared with these most restrictive concentration guides. Concentrations of radionuclides in the soil are compared with Rockwell internal soil standards for the 200 Areas (Boothe, 1979). All Rockwell environmental radionuclide data are also compared with background data obtained by the Pacific Northwest Laboratory (PNL) environmental surveillance program (Sula et al., 1982) to determine the impact of Rockwell operations on the environment. Results indicated overall compliance with applicable DOE and Rockwell guidelines and standards during 1981. Several areas were observed to have surface contamination levels exceeding radiological control posting requirements. Corrective action has been taken to decontaminate or appropriately post these areas. There was no evidence to indicate any radiological health hazards originating from environmental sources during 1981.

60185 **Use of gamma-ray detection instrumentation in ORNL's offsite radiological survey program.** Berven, B.A.; Myrick, T.E.; Perdue, P.T. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **41**: 235(Jun 1982). (CONF-820609—).

From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

60186 **(PB—82-191123) Agricultural measures to reduce radiation doses to man caused by severe nuclear accidents.** van Dorp, F.; Eleveld, R.; Frissel, M.J. (Commission of the European Communities, Luxembourg). [nd]. 126p. (EUR—7370-EN). NTIS PCE06/MF E06.

If agricultural land and products become contaminated after a severe nuclear accident, radiation doses to man caused by the ingestion of contaminated agricultural products will be unacceptably high. Radiation doses to man can be estimated by using models which describe quantitatively the transfer of radionuclides through the biosphere. Depending on the degree of contamination (to be predicted by atmospheric dispersion models, or to be determined by direct measurements), and depending on the estimated radiation doses to man (to be calculated by using the models described in this study) measures can be devised. The most important short- and long-term measures are described. Special attention has been paid to the practicability of the measures. A cost-analysis, however, was not carried out. Some of the fields for future research are discussed.

60187 **(INIS-mf—7067) 1979 annual report.** (Bundesanstalt fuer Fleischforschung, Kulmbach (Germany, F.R.)). [nd]. 60p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780670.

The task of the Federal Institute for Meat Research is to serve the population of the FRG and to guarantee its supply with meat and meat products including slaughter fats and products of the poultry-farming including eggs in sufficient quantities, of high nutrition-physiological quality and free from residues hazardous to health. In this connection, the Federal Ministries are advised, the consumers protected and the competition within the home meat industry is supported; at the same time, the institute helps to expand the scientific level of knowledge. To fulfil these tasks, following subjects are being explored. Factors of profitable production and use of meat and poultry products; fundamentals of keeping, improving, and judging the quality of meat animals, meat, meat and poultry products including eggs; the occurrence and the importance of perish-causing, food poisoning or technologically necessary microorganisms; the occurrence and the effects of health-hazarding residues in animal food; in slaughter animals, meat, meat and poultry

products including eggs; the technology of processing and preserving meat and the effects of additives and auxiliaries; methods of analysing additives and residues and the judgement of meat products and egg products with regard to legal regulations concerning food stuff; measuring the radioactive contamination and methods of decontaminating slaughter animals, meat, meat products and poultry products.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 59139, 59226, 59313, 59325, 60177, 60202

5106 Regulations

REFER ALSO TO CITATION(S) 59648, 59649, 59650, 59651, 59652

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 59464, 59466, 60148

60188 **(ORNL/TM—8270) Evaluation and critique of in-situ experimental systems for investigating effects of stress in lentic ecosystems.** Adams, S.M. (Oak Ridge National Lab., TN (USA)). Jul 1982. Contract W-7405-ENG-26. 55p. NTIS, PC A04/MF A01. Order Number DE82020478.

A variety of in situ experimental enclosures are evaluated and critiqued, and recommendations are made for their optimal use in assessing effects of perturbations in lentic (standing water) ecosystems. With proper design and monitoring, in situ enclosures can be valuable experimental tools for assessing the effects of induced stress in lentic ecosystems. These enclosures can be used to (1) study intact communities and the interactions between important community components, (2) manipulate and control various critical environmental variables, and (3) study the same communities or processes over relatively long time periods. Constraints of these systems are: (1) circulation patterns inside enclosures may be altered, (2) physicochemical and biological processes may be distorted, (3) sediment-water interactions may be reduced, (4) replicability and control may be sacrificed, and (5) cost and maintenance may be high. In the design of experiments, particular attention should be paid to including the representative functional relationships and approximating the density or biomass ratios of the major trophic groups present in the natural system. Monitoring should emphasize functional and aggregate responses of organisms and communities, respectively, and the size frequency distribution of plankton and suspended particles.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 59175, 59222, 60173, 60193

60189 **(PB—82-179920) Copper cycling in the Patuxent River estuary and condenser micro-fouling studies.** Eaton, A.; Chamberlain, C. (Johns Hopkins Univ., Baltimore, MD (USA)). Jan 1982. 93p. NTIS, PC A05/MF A01.

This report describes the methods and results of a study of copper cycling in the Patuxent River estuary. The study focused on detailed sampling of the water column over a number of seasons to determine: (1) the amount of excess copper in the estuary which may be attributable to corrosion of condenser tubes at the Chalk Point Power Plant; (2) the geographic distribution of excess copper in the estuary, (3) the forms of excess copper, and (4) the fate of added copper. Extensive sampling was performed including sampling above and below the pycnocline, sampling in cross channel transects and resampling stations at different tidal stages to establish short term variability. Estimates for the amount of excess copper in the Patuxent are derived and the potential impact of that excess is assessed. This report also presents the results of studies of microfouling processes in power plant condensers employing once-through cooling. The studies entailed: (1) the isolation and characterization of 38 bacterial isolates from effluents and condenser tubes of the Crane Power Plant which is located on Saltpeter Creek, approximately ten miles northeast of Baltimore, Maryland and the Chalk Point Power Plant on the Patuxent River, (2) laboratory experiments on colonization rates using pure cultures at high nutrient levels, and (3) growth studies on the joint influence of copper and nutrient levels.

60190 **(PB—82-188244) Water quality criteria, second edition. Report for Jul 60-Feb 63.** McKee, J.E.; Wolf, H.W. (California Inst. of Tech., Pasadena (USA)). May 1963. 566p. (PUB—3-A). NTIS, PC A24/MF A01.

This water quality compendium surveys potential pollutants, including chemical, physical, biological, radiological or mixed, in alphabetical order, according to the most logical designation; appropriate cross-referencing. For each pollutant there is a brief statement of general information, such as characteristics and typical sources, cross-references and bibliography, a summary of limiting and/or threshold concentrations for various beneficial uses.

60191 **Relationships between sulfate and nitrate ion concentrations and rainfall pH for use in modeling applications.** McNaughton, D.J. (Pacific Northwest Lab., Richland, WA). *Atmospheric Environment;* **15**: No. 6, 1075-1079(1981). Contract AC06-76RL01830.

Precipitation chemistry data for the north-east United States are analyzed to test relationships between anthropogenic sulfate and nitrate ion contributions and rainfall pH. Results are presented and an application of a derived regression equation is made to estimate rainfall pH values from long-range transport model deposition predictions.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 59228, 59290, 59311, 59320, 59327, 60190

60192 (INIS-SU—86, pp 217-218) **Radiochemical fundamental of forecasting of radionuclide behaviour in hydrosphere.** Kuznetsov, Yu.V.; Legin, V.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

60193 **(RHO-HS-SR—5P) Results of the Separations Area ground-water monitoring network for 1981.** Wilbur, J.S.; Graham, M.J. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jul 1982. Contract AC06-77RL01030. 88p. NTIS, PC A05/MF A01. Order Number DE82020562.

Portions of document are illegible.

This report summarizes and interprets the results of the Separations Area ground-water monitoring program for calendar year 1981. The Separations Area ground-water monitoring program satisfies US Department of Energy requirements that all onsite discharges be monitored. There are 105 water quality monitoring wells in the 1981 Separations Area monitoring network. Samples from the water quality monitoring wells were collected at monthly or semiannual intervals. These samples were analyzed selectively for total alpha, total beta, ^{60}Co, ^{106}Ru, ^{137}Cs, ^{90}Sr, tritium, uranium, and nitrate. Review of 1981 results indicated few changes from 1980. The 3000-pCi/mL tritium guideline was exceeded in three wells that monitor two active sites: Well 299-E24-2 monitors the 216-A-10 Crib, and Wells 299-E25-18 and 299-E25-20 monitor 219-A-37 Crib. Sample concentrations reflect plume migrations of active sites. With the exception of tritium, all contamination greater than 10% of Table II guidelines in the ground water under the Separations Area was caused by past disposal to inactive sites. The only samples with contamination that exceeded Table II guidelines were collected from Wells 299-W22-1, 299-E28-23, and 299-E33-27, which monitor the inactive 216-S-1 and -2 Crib, 216-B-5 Reverse Well, and 216-BX Tank Farm. However, the zone of contamination appears stable and highly localized for these sites. Analysis of contamination plumes within the Separations Area indicates that con-

tamination levels in ground water migrating out of the Separations Area at this time are less than the DOE Table II guidelines.

60194 (SSA—1981-TS-2, pp 401-403) **Cesium concentration factors between seawater and five species of lagoon fishes.** Meyer, J.; Ducousso, R. (Hopital d'Instruction des Armees Sainte-Anne, 83 - Toulon-Naval (France). Centre d'Etudes et de Recherches Biophysiques Appliquees a la Marine). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60195 **(STUDSVIK-K2—80-432) Sedimentation of cobalt-60 and cesium-137 in the bay of Tvaeren 1964-1980.** Ramberg, L.; Lampe, S. (Studsvik Energiteknik AB, Nykoeping (Sweden)). Nov 1980. 28p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702104.

Since 1964 the Co-60 and Cs-137 radioactivity of the sediments of the Tvaeren bay has been recorded every year at several points. Changes have been analysed in relation to atmospheric fallout releases from Studsvik distance from release point and depth. Estimates of total quantity for both nuclides bound up in the sediments and a forecast of future trends are presented. Sedimentation coefficients have been calculated and the factors which govern the degree of sedimentation are discussed.(G.B.).

60196 **(DOE/EV/10010—2) Historical ^{14}C measurements from the Atlantic, Pacific and Indian Oceans. Final report.** Fairhall, A.W.; Young, A.W. (Washington Univ., Seattle (USA); Pacific Marine Environmental Lab., Seattle, WA (USA)). [nd]. Contract AT06-79EV10010. 48p. NTIS, PC A03/MF A01. Order Number DE82020639.

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Atmospheric nuclear testing produced a dramatic increase in the level of ^{14}C in atmospheric CO_2. Since the tropospheric residence time of ^{14}C is on the order of a few years before being transferred to the sea, it appeared that a study of the distribution of the excess ^{14}C in the sea and its change with time would give valuable insight into such problems as the rate of CO_2 exchange between the atmosphere and the sea and its dependence on wind speed over the sea surface; the rate of transfer by oceanic mixing processes of contaminants, including fallout radionuclides introduced initially into the mixed surface layer of the sea, into the deep sea; the rate of bottom water formation at high latitudes and subsequent advective transport from these source regions into the deep sea. Therefore a ^{14}C sampling program was initiated. A method was developed for stripping CO_2 from sea water on board ship. The assay for ^{14}C was performed by a radiocarbon gas proportional counter. Information on temperature and salinity at the various sampling depths as well as total CO_2 and absolute concentration of ^{14}C is tabulated. (JGB)

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 59136

5206 Regulations

REFER ALSO TO CITATION(S) 59648, 59649, 59650, 59651, 59652

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5301 Social And Economic Studies

60197 **(EDF-R—81H404234) National Hydraulic Laboratory. Progress Report 1980.** Bernier, J. (Electricite de France, 78 - Chatou. Lab. National d'Hydraulique). Jan 1981. 72p. (In French). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82702390.

The activities of the Laboratoire National d'Hydraulique in 1980 are in keeping with continuity: (a) in the distribution of the work concerning Electricite de France (70%) and that pursued in liaison with outside organizations, government departments, public and private firms (30%) and (b) on the methodological level, in the development of the means of calculation applied in various domains. Amongst these should be noted the permanence of the operational problems of production facilities, particularly those arising from the cooling towers and the site studies of nuclear power plants.

60198 **(PB—82-183492) Economic impact analysis, RCRA (Resource Conservation and Recovery Act) interim status standards. Volume I.** (Little (Arthur D.), Inc., Cambridge, MA (USA)). 1981. 162p. NTIS, PC A08/MF A01.

This Economic Impact Analysis of Phase I of the Resource Conservation and Recovery Act (RCRA) Subtitle C hazardous waste program analyzes the costs and impacts of regulations for generators; transporters; and treaters, storers, and disposers under the Interim Status Standards (ISS).

60199 **(PB—82-183500) Economic impact analysis, RCRA (Resource Conservation and Recovery Act) interim status standards. Volume II.** (Little (Arthur D.), Inc., Cambridge, MA (USA)). 1981. 245p. NTIS, PC A11/MF A01.

Contents: Specific compliance requirements under RCRA; Unit costs; Off-site waste disposal prices; Projected U.S. inflation rates; Cost of capital; Economic characterization and impact on selected generator industries.

60200 **(PB—82-183518) Economic impact analysis, RCRA (Resource Conservation and Recovery Act) interim status standards. Volume III.** (Little (Arthur D.), Inc., Cambridge, MA (USA)). 1981. 322p. NTIS, PC A14/MF A01.

This appendix discusses the data bases on which model plant specifications were based and expands on the specifications for surface impoundments. The last section of the appendix contains the data for all 22 industries used in calculating compliance costs. The major sources of data for the model plants are summarized.

60201 **(PB—82-183526) Economic impact analysis, RCRA (Resource Conservation and Recovery Act) interim status standards. Volume IV.** (Little (Arthur D.), Inc., Cambridge, MA (USA)). 1981. 204p. NTIS, PC A10/MF A01.

This appendix contains two sets of sample calculations. The first example treats an industry segment, phenolic resins, according to the methodology used by Arthur D. Little, Inc., for the industries for which other contractors did not provide basic data. The second example treats an industry, leather tanning, for which, the basic data were provided by another contractor. The two methods differed somewhat -- particularly in the definition of model plant subcategories and in the way the subcategories are aggregated.

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 59660

60202 **(DOE/EIS—0094D) Sale of segment O of the Oak Ridge Reservation to the City of Oak Ridge, Tennessee (Proposed site for Tennessee Synfuels Associates coal-to-gasoline facility). Draft environmental impact statement.** (Department of Energy, Oak Ridge, TN (USA). Oak Ridge Operations Office). Aug 1982. 458p. Dept. of Energy, Oak Ridge Operations, Environmental Protection Branch, P.O. Box E, Oak Ridge, TN 37830.

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The statement assesses the environmental impacts associated with the sale of approximately 492 hectares (1217 acres) and related easements for industrial development to aid the City of Oak Ridge in achieving economic self-sufficiency as required by the Atomic Energy Community Act of 1955. The City has expressed its intent to sell the site for construction of a plant for the production of 50,000 bpd of liquid fuels (primarily gasoline) from coal using gasification, methanol synthesis, and synthesis of gasoline from methanol. The impacts which would be associated with that plant are also addressed in terms of air quality, solid waste disposal, water quality, noise, terrestrial and aquatic ecology, public and occupational health, socioeconomic conditions, historic resources, aesthet-

ics, transportation, effects of potential accidents, and impacts upon existing DOE facilities in the Oak Ridge area. Significant beneficial economic impacts are projected for increasing employment in the area and through taxes paid to Roane County and the City of Oak Ridge. Potentially significant adverse impacts which have been identified include: odors from hydrogen sulfide in the area near the plant; permanent use of the site for the disposal of waste from the plant; possible risk to groundwater should materials containment fail; noise from the flare during emergencies, upsets, and startup; removal of onsite habitat for plant and animal species; population increases, employment and population fluctuation, and increased demand in a tight housing market; aesthetic degradation due to plant visibility and to illumination and noise from the flare; blockage of Blair Road and noise due to rail transport; traffic increases on TN 58 to over twice capacity during construction of the TSA plant, with resulting congestion, delays and service degradation; and increased risk of fatalities, injuries, and property damage resulting from product transportation accidents.

60203 **(EDF-CONF—81E117698) Evaluation of hazards from industrial activity near nuclear power plants. Study of typical accidents.** Lannoy, A.; Gobert, T.; Granier, J.P. (Electricite de France, 75 - Paris. Direction des Etudes et Recherches). Aug 1981. 10p. (In French). (CONF-810801—83). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702362.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The design and dimensioning of nuclear power plant structures necessitate the evaluation of risks due to industrial activity. Among these risks, those due to the storage or transport of dangerous products merit special attention. They result, inter alia, in the explosion of flammable gas clouds. Such clouds can drift before igniting and, once alight, the resulting pressure wave can cause serious damage, even at a distance. A methodology both deterministic and probabilistic enabling this risk to be quantified has therefore been developed. It is based in part on an analysis of the statistics of actual accidents that have occurred. After briefly recalling the probabilistic model, the typical accidents selected are described and for three usual cases (storage under pressure, rail tank cars and road units) the main characteristics of the rupture are explicited. The deterministic models that have been worked out to calculate the consequences of such an accident: flow rate at the bursting point, evaporation, drift and atmospheric dispersion of the cloud formed, explosion of this cloud, are then described. At the present time the overpressure wave is quantified against a TNT equivalent of the explosive mixture. Some data are given as examples for three commonly employed hydrocarbons (butane, propane, propylene).

5303 Environmental Impact Statements

REFER ALSO TO CITATION(S) 59280

60204 **(DOE/EA—0195) L-Reactor operation, Savannah River Plant: environmental assessment.** (USDOE Assistant Secretary for Defense Programs, Washington, DC. Office of Nuclear Materials Production). Aug 1982. 210p. NTIS, PC A10/MF A01. Order Number DE82020304.

The purpose of this document is to assess the significance of the effects on the human environment of the proposed resumption of L-reactor operation at the Savannah River Plant, scheduled for October 1983. The discussion is presented under the following section headings: need for resumption of L-Reactor operations and purpose of this environmental assessment; proposed action and alternative; affected environment (including, site location and description, land use, historic and archeological resources, socioeconomic and community characteristics, geology and seismology, hydrology, meteorology and climatology, ecology, and radiation environment); environmental consequences; summary of projected L-Reactor releases and impacts; and Federal and State permits and approval. The three appendices are entitled: radiation dose calculation methods and assumptions; floodplain/wetlands assessment - L-Reactor operations; and, conversion table. A list of references is included at the end of each chapter.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5502 Biochemistry

REFER ALSO TO CITATION(S) 59887, 59888, 59898, 60228, 60229, 60234, 60315

60205 **(DOE/ER/03326—T1) Photochemistry and enzymology of photosynthesis. Progress report and renewal proposal.** (Martin Marietta Labs., Baltimore, MD (USA)). Aug 1980. Contract AC02-76ER03326. 112p. NTIS, PC A06/MF A01. Order Number DE82021992.

Portions of document are illegible.

This work consists of three basic tasks: (1) mass spectrometer studies involving measurements in flashing light; (2) biochemical studies of chloroplast copper proteins; and (3) light harvesting and electron transport in C_4 plants. In the first task, a specially designed mass spectrometer system will be used to monitor the gas exchange occurring in response to single short flashes of light. This technique will also be used in conjunction with continuous light measurements, to study the light-induced exchange of O_2 and CO_2 in algae. The second task will continue to focus on the role of chloroplast copper in photosynthesis. A thylakoid-bound polyphenol oxidase enzyme was isolated and purified from spinach chloroplasts. The role of this enzyme in the chloroplast will be determined and some of its unusual and intriguing properties will be characterized. The third task is a series of studies related to the light-harvesting and electron-transport mechanisms of C_4 plants. Ongoing work relating to this task will be devoted to (1) the cyclic operation of photosystem I and (2) photosystem II assays, especially the oxidation of tetraphenylboron. (ERB)

60206 **(FRNC-TH—1032) Quality control of radioimmunoassays and validation of beta-2-microglobulin radioimmunoassay.** Garcin-Rambaud, M.-J. (Aix-Marseille-2 Univ., 13 - Marseille (France)). Apr 1980. 143p. (In French). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780671.

Thesis.

The aim of this work was to devise a quality check procedure for radioimmunological analyses, easily applicable in all laboratories. The parameters most commonly analysed during such a test are: non-specific activity; total binding capacity; reproducibility; sensitivity; accuracy; specificity; specific activity of the labelled substance; affinity constant of the antigen towards its specific antibody. In the method proposed the calibration curve of any series of measurements is established by Rodbard's method. For the reproducibility study the use of Ekins' method, modified by Grillet and Marchand, was preferred. From the results obtained it is possible to plot the error-response relationship (ERR) and to establish the accuracy profile which gives a good idea of the sensitivity of the analysis method. For the specificity study this method matches the usual operational conditions as closely as possible. The determination is made on the following mixture: a half-volume (with respect to the usual volume) of biological liquid studied and previously analysed for cold antigen Ag^0; a half-volume of one of the dilutions prepared with the substance X liable to interfere during the Ag^0 determination. Any interferences between the substance X and the antigen are then plotted on a graph representing: as abscisse, the concentration of substance X; as ordinates, the difference between the measured and theoretical Ag^0 concentrations. This very simple representation shows the interference threshold of each substance X; accounting for its physiopathological concentration.

60207 (SSA—1981-TS-2, pp 315-320) **Postnatal neurogenesis in the granular layer of the dentate gyrus in the young rabbit. Electron and photon microscopic autoradiographic study.** Gueneau, G.; Drouet, J.; Privat, A.; Baron, D. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie); Court, L. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60208 **Anionic modulation of the catalytic activity of hydrogenase from Chlamydomonas reinhardtii.** Roessler, P.; Lien, S. (Solar Energy Research Inst., Golden, CO). *Archives of Biochemistry and Biophysics;* **213**: No. 1, 37-44(Jan 1982). Contract AC02-77CH00178.

Hydrogen production by cell-free extracts of Chlamydomonas reinhardtii is stimulated by anions when methyl viologen, reduced by dithionite, is used as the electron donor to hydrogenase. The increasing effectiveness of various anions closely follows their position in the Hofmeister chaotropic sequence. The most stimulatory anion tested, I^-, gives a six-fold increase in activity at a concentration of 0.5 N. The K/sub m/ of the enzyme for methyl viologen is not affected by anions, while the V is greatly increased. H_2 oxidation coupled to methyl viologen reduction is also greatly stimulated by anions. However, when reduced ferredoxin is used as the electron donor to hydrogenase, there is a very strong inhibition of H_2 production by salts. In this case, the V of the enzyme is unaffected, but there is a large increase in the K/sub m/ of the enzyme for ferredoxin. The most inhibitory salt tested, KI, decreases hydrogenase activity by 93% at a concentration of 0.2 N.

60209 **Electronic method for autofluorography of macromolecules on two-D matrices.** Davidson, J.B.; Case, A.L. (to Dept. of Energy). US Patent Application 335,998. 30 Dec 1981. 20p. Contract W-7405-ENG-26.

A method for detecting, localizing, and quantifying macromolecules contained in a two-dimensional matrix is provided which employs a television-based position sensitive detection system. A molecule-containing matrix may be produced by conventional means to produce spots of light at the molecule locations which are detected by the television system. The matrix, such as a gel matrix, is exposed to an electronic camera system including an image-intensifier and secondary electron conduction camera capable of light integrating times of many minutes. A light image stored in the form of a charge image on the camera tube target is scanned by conventional television techniques, digitized, and stored in a digital memory. Intensity of any point on the image may be determined from the number at the memory address of the point. The entire image may be displayed on a television monitor for inspection and photographing or individual spots may be analyzed through selected readout of the memory locations. Compared to conventional film exposure methods, the exposure time may be reduced 100 to 1000 times.

60210 **Isolation and characterization of the iron-containing superoxide dismutase of Methanobacterium bryantii.** Kirby, T.W.; Lancaster, J.R. Jr.; Fridovich, I. (Duke Univ., Durham, NC). *Archives of Biochemistry and Biophysics;* **210**: No. 1, 140-148(Aug 1981).

Methanobacterium bryantii contains a single electrophoretically discernible superoxide dismutase, which constitutes 0.4% of the extractable protein.This enzyme has been purified to electrophoretic and ultracentrifugal homogeneity. It appears to be a tetramer. The subunits were tenaciously, but noncovalently bonded and were of identical size. The molecular weight of the enzyme was found to be 91,000 +/- 2000. The specific activity of this enzyme was identical to that previously noted for the corresponding enzyme from Escherichia coli. The enzyme contained 2.7 atoms of Fe, 1.7 atoms of Zn, and less than 0.2 atoms Mn per tetramer. Its amino acid composition placed this enzyme with the other Mn- and Fe-containing superoxide dismutases. The M. bryantii enzyme was also similar to previously described Fe-containing superoxide dismutases in its optical and electron paramagnetic resonance spectra and in its susceptibility to inactivation by H_2O_2. The M. bryantii enzyme was inhibited by N_3^-, but was less sensitive towards this inhibitor than other iron-containing superoxide dismutases.

5503 Cytology

REFER ALSO TO CITATION(S) 60230, 60234

5504 Genetics

REFER ALSO TO CITATION(S) 60229, 60234

60211 **Bacillus subtilis bacteriophage SPβc1 is a deletion mutant of SPβ.** Fink, P.S.; Korman, R.Z.; Odebralski, J.M.; Zahler, S.A. (Cornell Univ., Ithaca, NY). *Molecular and General Genetics;* **182**: 514-515(1981).

The restriction fragment patterns of two mutant forms of the temperate Bacillus subtilis bacteriophage SPβ have been examined. The DNA of a heat-inducible mutant, SPβc2, which has a molecular size of 128 kilobases (kb), yields the same restriction pattern as the wild type SPβc$^+$ DNA. The DNA of a clear-plaque mutant, SPβc1, has a molecular size of 117 kb, and is deleted for an 11 kb region of phage DNA. Neither SPβc1 nor SPβc2 DNA is cleaved by the endonuclease HaeIII.

60212 **Pollen embryogenesis to induce, detect, and analyze mutants.** Constantin, M.J. (Comparative Animal Research Lab., Oak Ridge, TN). *Environmental Health Perspectives;* **37**: 27-33(1981).

The development of fully differentiated plants from individual pollen grains through a series of developmental phases that resemble embryogenesis beginning with the zygote was demonstrated during the mid-1960's. This technology opened the door to the use of haploid plants (sporophytes with the gametic number of chromosomes) for plant breeding and genetic studies, biochemical and metabolic studies, and the selection of mutations. Although pollen embryogenesis has been demonstrated successfully in numerous plant genera, the procedure cannot as yet be used routinely to generate large populations of plants for experiments. Practical results from use of the technology in genetic toxicology research to detect mutations have failed to fully realize the theoretical potential; further developments of the technology could overcome the limitations. Pollen embryogenesis could be used to develop plants from mutant pollen grains to verify that genetic changes are involved. Through either spontaneous or induced chromosome doubling, these plants can be made homozygous and used to analyze genetically the mutants involved. The success of this approach will depend on the mutant frequency relative to the fraction of pollen grains that undergo embryogenesis; these two factors will dictate population size needed for success. Research effort is needed to further develop pollen embryogenesis for use in the detection of genotoxins under both laboratory and in situ conditions.

60213 **Monomer plasmid DNA transforms Streptococcus pneumoniae.** Saunders, C.W.; Guild, W.R. (Duke Univ., Durham, NC). *Molecular and General Genetics;* **181**: 57-62(1981). Contract AS05-76EV03941.

The covalently closed (CC) monomer form of plasmid pMV158 was found to transform pneumococcus (Streptococcus pneumoniae) and to do so with two-hit kinetics. The evidence came from analysis of the behavior of the transforming activity in fractions from preparative gel electrophoresis. Activity in the first major peak to elute (i) co-eluted with monomer CC as detected on analytical gels, (ii) banded as CC in dye-buoyancy gradients, (iii) sedimented with the velocity expected for monomer CC, and (iv) gave two-hit kinetics as functions of both concentration and time of exposure of the cells to DNA. A second major peak of activity behaved physically as though mostly due to dimer CC forms and gave single-hit response curves. Because almost no dimer was detectable optically on analytical gels of starting preparations, its specific activity was high relative to that of the monomers.

60214 **Psychobiology of experimental hypertension: evaluation of the Dahl rat lines.** Haber, S.B. (Brookhaven National Lab., Upton, NY); Friedman, R. *Behavior Genetics;* 11: No. 5, 505-515(1981). Contract AC02-76CH00016.

The Dahl salt-sensitive (DS) and salt-resistant (DR) rat lines were selectively bred to show opposite genetically determined blood pressure responses to excess sodium chloride ingestion. These animals have provided significant anatomical, physiological, and biochemical data concerning the pathological mechanisms of experimental hypertension. Research is also being conducted to determine the relevance of psychobiological and behavioral variables in these two lines. The rationale for the selection and maintenance of the Dahl model and the physiological, biochemical, and behavioral characteristics which distinguish DS and DR rats are presented. Although originally developed for the study of salt-induced hypertension, special attention is given to the application of this animal model in behavior genetic research, stressing its inherent advantages and limitations. The use of the Dahl model in psychobiological studies and the utility of the model for future behavioral, genetic, and psychophysiological research are also detailed.

5505 Metabolism

REFER ALSO TO CITATION(S) 60280, 60285

5506 Medicine

REFER ALSO TO CITATION(S) 59859, 59860, 59890, 59891, 59892, 59897, 60047, 60048, 60084, 60097

60215 **(CEA-CONF—5938) Articulation prostheses made of polymers which are improved by ionizing radiations.** Gaussens, G.; Nicaise, M.; Tran, K.O. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Office des Rayonnements Ionisants). Oct 1981. 5p. (In French). (CONF-8109134—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702367.

From International conference on industrial application of radioisotopes and radiation technology; Grenoble, France (28 Sep 1981).

Articulation prostheses for the human body are generally made of the couple very high molecular weight polyethylene-special steels. Polyethylene properties are modified by ionizing radiations: creep resistance is improved and friction coefficient is decreased. Modifications are controlled by the choice of radiation dose and dose rate. Wear tests have been made on hip prostheses.

60216 **(CEA-CONF—5979) Single photon emission computed tomography using a regularizing iterative method for attenuation correction.** Soussaline, F.P.; Cao, A.; Lecoq, G. (CEA, 91 - Orsay (France). Service Hospitalier Frederic Joliot; CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service d'Etudes des Reacteurs et de Mathematiques Appliquees). Jun 1981. 25p. (CONF-8106252—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702975.

From 7. international conference on medical imaging processing; Stanford, CA, USA (22 Jun 1981).

A complete review of the rationale and implementation of the different attenuation compensation methods using either Fourier space (or convolution) or iterative technique is given by T.F. Budinger et al. An alternative to the second approach is proposed here. The problem is considered in the context of its analytical formulation and exact 'tomographic operators' are defined which include the physical properties of gamma-emission tomographic systems. The method proposed belongs to the class of analytical techniques. Although the solution to the 'Tomographic Operators' is an iterative one, this method differs from other iterative techniques in that the mathematics of the procedure is well understood and solutions can be derived for the tomographic-operators in their most general form with the potential of handling three important factors: the actual physical response of the object-detector system, the reduction of noise and the convergence speed.

60217 **(CEA-CONF—6043) Attenuation correction in the emission tomography reconstruction problem using a regularizing iterative method.** Soussaline, F.; Cao, A.; Le Coq, G.; Raynaud, C. (CEA, 91 - Orsay (France). Service Hospitalier Frederic Joliot). Sep 1981. 5p. (CONF-810996—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702408.

From European Society of Nuclear Medicine meeting; Bern, Switzerland (8 Sep 1981).

A Regularizing Iterative Method is proposed which is able to provide fast and accurate reconstruction of 2 D transverse sections, when physical effects such as attenuation are taken into account. The results obtained on phantoms show that for a very small number of iterations, the method provides significantly better relative and absolute quantitative capability with contrast improved when compared to filtered back projection techniques.

60218 **(CEA-CONF—6044) Need for a quality control program in emission tomography.** Soussaline, F.; Todd-Pokropek, A.E. (CEA, 91 - Orsay (France). Service Hospitalier Frederic Joliot). Sep 1981. 4p. (CONF-810996—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702409.

From European Society of Nuclear Medicine meeting; Bern, Switzerland (8 Sep 1981).

It is particularly important for a single photon tomographic system (SPECT) that the measurement conditions be-well-defined. Even then, traps exist. It has been observed, in comparing two "identical" systems that, for the same resolution, sensitivity, uniformity etc, differences of almost an order in the apparent contrast were observed. This effect was a result of a slightly different energy window setting, and caused by the effect of scatter increasing the tail effect. The definition of a set of standard phantoms and measurement protocols should be a high priority for one of the international standards agencies. Without such a programme, it is possible that some centres will use SPECT systems without them being properly set-up, and, as a result, obtain potential very high clinical false positive rates.

60219 **(INIS-mf—7050) Determining the orientation of the knee joint from stereo radiographs and 90° bi-plane radiographs.** Frobin, W. (Muenster Univ. (Germany, F.R.). Sonderforschungsbereich 88 Teratologische Forschung und Rehabilitation Mehrfachbehinderter). Feb 1980. 27p. (In German). (SFB—88/C1(No.24)). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780674.

In this work is investigated the measurement of the spatial direction of the axis of rotation of the knee joint from stereo radiographs and from 90° bi-plane radiographs. The methods to be described are based on geometrical properties of the femur condyles and their contours in radiographs. Therefore, a use of metal markers in the patient is not necessary. Taking into account the properties of contours in radiographs, the double tangency to the contours can be interpreted as the picture of a tangent plane to the femur condyles. Measurements were carried out on a phantom. They have been done in order to find out, how good the hypothesis of a cylindrical envelope to the condyles is. Radiographs have been made for different orientations of the knee with respect to the X-ray apparatus. The results have been transformed into a unique coordinate system, which was fixed to the femur. The accuracy of the reconstructed direction of the knee axis is +-1 degree for the component in the cranio-caudal direction and +-2 to 3 degrees for the component in the dorso-ventral direction.

60220 **(INIS-mf—7056) Computer program for unilateral renal clearance calculation by a modified Oberhausen method.** Brueggemann, G. (Tuebingen Univ. (Germany, F.R.). Medizinische Fakultaet). 1980. 60p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780676.

Thesis.

A FORTAN program is presented which, on the basis of data obtained with NUKLEOPAN M, calculates the glomerular filtration rate with sup(99m)Tc-DTPA, the unilateral effective renal plasma flow with ^{131}I-hippuran, and the parameters for describing the isotope rephrogram (ING) with ^{131}I-hippuran. The results are

calculated fully automatically upon entry of the data, and the results are processed and printed out. The theoretical fundamentals of ING and whole-body clearance calculation are presented as well as the methods available for unilateral clearance calculation, and the FORTAN program is described in detail. The standard values of the method are documented, as well as a comparative gamma camera study of 48 patients in order to determine the accuracy of unilateral imaging with the NUKLEOPAN M instrument, a comparison of unilateral clearances by the Oberhausen and Taplin methods, and a comparison between 7/17' plasma clearance and whole-body clearance. Problems and findings of the method are discussed.

60221 **(INIS-mf—7065) Measurement by film dosimetry and calculation of energy dose distributions for electron and photon irradiation of 42 MeV using the Alderson phantom for planning of pendulum irradiation of the mediastinum in the treatment of peripheral bronchial carcinomas.** Foerster, W. (Kiel Univ. (Germany, F.R.). Abt. Radiologie). (Kiel Univ. (Germany, F.R.). Medizinische Fakultaet). 16 Jun 1980. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780673.

Thesis.

The energy dose distribution in an Alderson phantom applying a radiation energy of 42 MeV has been determined by film dosimetry and computation; the results have been compared in order to verify both methods and to improve the irradiation of bronchial carcinoma by achieving the best possible protection of healthy tissue and of the spinal cord. The comparative evaluations have shown that there is a good agreement between the calculated results and those measured by film dosimetry.

60222 **(INIS-mf—7066) Value of bone-seeking radiopharmaceuticals and quantification methods in diagnosing the type of a skeletal disease.** Schuster, F.K. (Muenchen Univ. (Germany, F.R.)). 6 Mar 1979. 44p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780677.

Thesis.

In 139 patients with skeletal changes and 133 patients without changes, 2-3 hours after injecting sup(99m)Tc-Sn-methylen-diphosphonate or sup(99m)Tc-Sn-pyrophosphate, the enrichment relations between the individual vertebral bodies, the sacrum, the reiosacral joints and peripheric bones and joints were calculated. In the normal case, with increasing age the count rate ratio ISG/os sacrum was decreasing. For patients with bone metastases in the vertebral column, quotients between 0.8 and 4.0 were calculated if related to the vertebral next but one. As for degenerative diseases of the vertebral column, values of 0.8 to 1.59 were obtained. This means that, when determining the relative bone storage, 70% of the metastases could not be distinguished from benign changes in the vertebra column. The highest count rate ratios or contrasts were obtained when norming to the opposite side in peripheric bone tumours and in patients with rheumatoid arthritis or arthritis urica of the smaller joints. It was not possible to differentiate arthrotic and inflammatory diseases of big joints. If quotients with values around 0.1 were calculated, floride osteoblastic processes can be excluded. Thus the quotient formation in bone scintiscanning represents a substantial support in the indication of invasive measures.

60223 **(INIS-mf—7084) Experimental investigations of radiological and nuclear functional diagnosis of the ureter.** Wolf, M. (Tuebingen Univ. (Germany, F.R.). Medizinische Fakultaet). 1980. 129p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780677.

Thesis.

A new nuclear method for reflux and motility investigations of the ureter is described, and its diagnostic potential is determined in model experiments. Thresholds of visualisation of a urine spindle are considered. The following results were obtained in animal experiments: 1) If investigations are repeated under identical conditions, there are considerable variations of refluxivity. 2) With IMCU (Isotope Micturition Cystoureterogram), the number of refluxes detected is about the same as with MCU (Micturition Cystoureterogram); this applies in particular to refluxes of the 3rd and 4th degree. 3) UKG is equal to AUR in judging the direction, time, velocity and frequency of discharge of a spindle while thickness and initial conus lenght of a spindle are better seen in AUR. 4) Inconstant depots of residual urine can be detected by UKG an AUR alike. The radiological observations made in the animal experiment are compared with the relevant literature, and possible error sources in the evaluation are indicated. Finally, the application of IMCU and UKG in humans is described. IMCU is recommended especially for pardiatric applications as the observation time is long and radiation exposure low. In renal function studies, the UKG supplies extensive information on functional data of the ureter which until now could be obtained only with the aid of contrast media.

60224 **(INIS-mf—7085) Quantitative determination of bone mineral concentrations using quotient densitometry in patients under long-term anticonvulsant therapy.** Schulz, H. (Kiel Univ. (Germany, F.R.). Medizinische Fakultaet). 12 Jun 1980. 78p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780675.

Thesis.

The effect on bone mineral concentration of anticonvulsive long-term therapy was investigated in order to find out if there is a relation between the occurence and extent of osteomalacial lesions on the one hand and the type and time of application of anticonvulsants. The hydroxyl apatite content was determined by X-ray densitometry. The method is considered to be suitable for yearly skeletal monitoring of epilepticians treated with anticonvulsants.

60225 (INIS-SU—74, pp 11-16) **Experience of usage of high-energy electron accelerators while radiotherapic treating of cancer in men.** Aleksandrov, N.N.; Muravskaya, G.V.; Tarutin, I.G. (Nauchno-Issledovatel'skii Inst. Onkologii i Meditsinskoj Radiologii, Minsk (Byelorussian SSR)). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Comparative evaluations of the results of distant gamma-therapy and megavoltage therapy by means of accelerators, are given. Megavoltage irradiation is shown to provide more vivid subjective and objective curing effect. Health improvement and removal of disease symptoms is achieved in 97%, that is 1.3 times more frequently, than in the result of distant gamma-therapy. The objective effect, determined clinically in megavoltage beam therapy, was obtained with 90% of patients, that turned to be on 10% higher, than when applying ^{60}Co. Introduction of high energy electron accelerators in the clinic practice is shown to be perspective.

60226 (INIS-SU—86, pp 210-211) **Osteotropic radiopharmaceuticals, their comparative clinic experimental estimation.** Arsent'eva, R.P.; Kozlova, M.D.; Kondrat'eva, T.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 12. Mendeleev's conference on general and applied chemistry; Moscow, USSR (1981).

60227 (SSA—1981-TS-2, pp 521-524) **Iodine 123 labelled O-iodohippuric acid. Dynamic study of kidney function.** Elizagaray, A.; Morcellet, J.L. (Hopital d'Instruction des Armees Sainte-Anne, 83 - Toulon-Naval (France). Centre d'Etudes et de Recherches Biophysiques Appliquees a la Marine). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60228 **Melanin content of hamster tissues, human tissues, and various melanomas.** Watts, K.P.; Fairchild, R.G.; Slatkin, D.N.; Greenberg, D.; Packer, S.; Atkins, H.L.; Hannon, S.J. (Brookhaven National Lab., Upton, NY). *Cancer Research;* **41**: 467-472(Feb 1981).

Melanin content (percentage by weight) was determined in both pigmented and nonpigmented tissues of Syrian golden hamsters bearing Greene melanoma. Melanin content was also measured in various other melanoma models (B-16 in C57 mice, Harding-Passey in BALB/c mice, and KHDD in C3H mice) and in nine human melanomas, as well as in selected normal tissues. The purpose was to evaluate the possible efficacy of chlorpromazine, which is known to bind to melanin, as a vehicle for boron transport in

neutron capture therapy. Successful therapy would depend upon selective uptake and absolute concentration of borated compounds in tumors; these parameters will in turn depend upon melanin concentration in melanomas and nonpigmented "background" tissues. Hamster whole eyes, hamster melanomas, and other well-pigmented animal melanomas were found to contain 0.3 to 0.8% melanin by weight, whereas human melanomas varied from 0.1 to 0.9% (average, 0.35%). Other tissues, with the exception of skin, were lower in content by a factor of ≧30. Melanin pigment was extracted from tissues, and the melanin content was determined spectrophotometrically. Measurements were found to be sensitive to the presence of other proteins. Previous procedures for isolating and quantifying melanin often neglected the importance of removing proteins and other interfering nonmelanic substances.

5507 Microbiology

REFER ALSO TO CITATION(S) 60189, 60210, 60211, 60213

60229 (BNL—31730) Organization and expression of bacteriophage T7 DNA. Studier, F.W.; Dunn, J.J. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 35p. (CONF-8206114—1). NTIS, PC A03/MF A01. Order Number DE82020742.

From Cold Spring Harbor symposium - quantitative biology; Cold Spring Harbor, NY, USA (2 Jun 1982).

Portions of document are illegible.

The availability of the complete nucleotide sequence of T7 DNA makes it possible to understand the organization and expression of T7 DNA at the nucleotide level. T7 genes are packed efficiently into the T7 DNA molecule, and are arranged in the order of their expression during infection. All transcription is from left to right, and the entry of T7 DNA into the cell may in fact be coupled to transcription of the DNA. A central feature of the strategy of infection is the specificity of T7 RNA polymerase for its own promoters, permitting both transcription and replication to be directed entirely to T7 DNA. Most T7 mRNAs are the products of specific cleavages by E. coli RNAase III, which appears to cut within certain base-paired structures in the RNA. T7 mRNAs compete well with host mRNAs for translation by ribosomes. Almost all T7 proteins seem to be synthesized independently, each from its own ribosome-binding and initiation site. Certain genes specify pairs of overlapping proteins, by initiating synthesis at two separate initiation sites in the same reading frame, or by shifting the reading frame during translation. The first and last 0.4% of the mature T7 DNA molecule contain a perfect direct repeat of 160 base pairs. Immediately adjacent to this terminal repetition, at both ends, are regular arrays of short repeated sequences, which presumably have some role in maturation and packaging of the DNA.

5509 Pathology

REFER ALSO TO CITATION(S) 60214

5510 Physiological Systems

REFER ALSO TO CITATION(S) 60214, 60227

60230 (BNL—31594) Regulation of hemopoiesis: inhibitors and stimulators produced by a murine bone marrow stromal cell line (H-1). Cronkite, E.P.; Miller, M.E.; Garnett, H.; Harigaya, K. (Brookhaven National Lab., Upton, NY (USA); University of the Witwatersrand, Johannesburg (South Africa). Dept. of Microbiology; Keio Univ., Tokyo (Japan). Dept. of Pathology). 1982. Contract AC02-76CH00016. 26p. (CONF-8206107—1). NTIS, PC A03/MF A01. Order Number DE82019980.

From 18. Alfred Benzon symposium - haemopoietic stem cells; Copenhagen, Denmark (13 Jun 1982).

A murine cell line (H-1) probably derived from the adventitial reticular cell has been isolated and preserved. This line produces: (1) CSF; (2) a labile inhibitor of CFU-c proliferation with preferential action on granulopoiesis; (3) PGE; (4) proliferation inhibitors of BFU-E and GEMM; and (5) suppression of entry of CFU-S into DNA synthesis in vitro. It is postulated that the adventitial reticular cell (ARC) may play a major regulatory role in hemopoiesis through intramedullary production of the factors described. The nature of the signals that activate the genes in the ARC which are coded for the factors described is not known.

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 60187

60231 (CONF-820856—1) Effects of harvesting schedules on nutrient depletion in forests. Johnson, D.W. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 34p. NTIS, PC A03/MF A01. Order Number DE82020808.

From IUFRO symposium on forest site and continuous productivity; Seattle, WA, USA (23 Aug 1982).

The effect of harvesting on nutrient removal from a given site is relatively easy to evaluate. The amount of nutrient removed varies with amount of biomass harvested, species, and age. However, broad generalization about any of these factors must be viewed with caution, because exceptions as well as unknowns may be significant. The importance of nutrient removal by harvesting to nutrient status and productivity of the ecosystem is difficult to assess, because the availability of nutrients to trees will be determined by a number of unpredictable factors, including atmospheric inputs, soil weathering, leaching, and microbial mineralization-immobilization (the latter being especially important for N). Thus, while many investigators have, through a nutrient evaluation, forecast problems with Ca supplies and few researchers forecast problems with N supplies due to intensive harvesting, the effects of harvesting on the availability of nutrients to the regenerating forest remains unknown and constitutes a significant research need.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 59337, 60077, 60078, 60110, 60165, 60186, 60194, 60230, 60274

60232 (BNL—31780) Clonal theory of radiation carcinogenesis. Baum, J.W. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 12p. (CONF-820931—3). NTIS, PC A02/MF A01. Order Number DE82022044.

From 8. symposium on microdosimetry; Julich, F.R. Germany (27 Sep 1982).

In some cases, usually involving high-LET radiations, the dose response at low doses follows a power function of dose with exponent less than one over a wide dose range. This type of response is of great interest since (a) it implies greater effect per unit dose at progressively smaller doses, and (b) it is not predicted by most models and theories of radiobiology. A theoretical framework is presented for responses having the above characteristics over a dose range extending over a factor of 1000. The model postulates precursor cells which occur in clones. Different numbers of precursor cells per clone are assumed. Suitable transformation of a single cell in a clone completes initiation of that clone and raises the probability of tumor formation. At low doses, clones with large numbers of cells at risk have relatively high probability of response. However, depletion of the number of untransformed large clones with increasing dose leaves primarily untransformed smaller clones with smaller probability of response per unit dose. The analytical results demonstrate that power functions with exponent less than one can result even for doses so small that the mean number of charged particle traversals per cell is much less than one. The results also demonstrate that response functions may change from nearly ~ D/.up 0.4/ to nearly linear as linear energy transfer (LET) of th . charged particle secondaries decreases. (ERB)

60233 **(CEA-CONF—5739) Results and prospects of radiotoxicological monitoring of workers exposed to natural or enriched uranium compounds.** Chalabreysse, J. (CEA Etablissement de la Vallee du Rhone, 26 - Pierrelatte (France). Service d'Hygiene Industrielle). May 1981. 10p. (In French). (CONF-8105160—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702355.

From Seminar on the development of radioprotection techniques for nuclear energy workers; Cadarache, France (5 May 1981).

The workers under supervision are exposed to natural or enriched uranium compounds in highly, moderately or slightly transferable form. Apart from systematic uranium determinations in the urine, occasional analyses of the stools and chest examinations, the working premises are also monitored. The urinary uranium test, an indirect method of measuring internal contamination, is considered of great value in the routine supervision of workers exposed to uraniferous compounds. It has brought out several important aspects, especially that of having a more accurate idea of the elimination time for the various compounds at the factory stage: for transferable compounds this is seldom longer than 48h. Another point is that the new classification introducing the notion of moderately transferable compounds (class w), of biological elimination period about 50 days, is found to be much more realistic than the old one where this notion was not accounted for (UO_2, UF_4). Finally in the light of this test the authors question whether the biological elimination period of little transferable compounds is as long as might be expected (500d), and intend to examine this idea in more detail.

60234 **(DOE/EV/03110—32) Cellular heredity in haploid cultures of somatic cells, March 1968-April 1981. Final report.** Freed, J.J. (Institute for Cancer Research, Philadelphia, PA (USA). Fox Chase Cancer Center). Mar 1982. Contract AC02-76EV03110. 22p. NTIS, PC A02/MF A01. Order Number DE82018433.

An account is given of the development and application to cell-culture genetics of unique haploid cell lines from frog embryo developed in this laboratory. Since 1968, the main aim of this project has been to develop the haploid cell system for studies of mutagenesis in culture, particularly by ultraviolet radiation. In the course of this work we isolated chromosomally stable cell lines, derived and characterized a number of variants, and adapted cell hybridization and other methods to this material. Particular emphasis was placed on ultraviolet photobiology, including studies of cell survival, mutagenesis, and pathways of repair of uv-damaged DNA. Although at present less widely used for genetic experiments than mammalian cell lines, the frog cells offer the advantages of authentic haploidy and a favorable repertory of DNA repair pathways for study of uv mutagenesis.

60235 **(DOE/EV/03728—15) Mutagenic effect of radionuclides incorporated into DNA of Drosophila melanogaster. Progress report, 1981-1982.** Lee, W.R. (Louisiana State Univ., Baton Rouge (USA). Dept. of Zoology and Physiology). 1982. Contract AS05-76EV03728. 15p. NTIS, PC A02/MF A01. Order Number DE82020761.

Portions of document are illegible.

Research during the 1981-1982 year emphasized the development of tests that can distinguish between mutations induced at the alcohol dehydrogenase (Adh) locus in Drosophila melanogaster by ionizing radiation, which induces largely deletions, and mutations that result from single base changes. For development of these tests three alleles at the Adh locus were used which have been shown by sequencing to differ by only a single base change, and for contrast a group of mutants induced by x-rays were used in which at least 71% of the mutants were deletions. Two tests that give complementary information were selected and progress in validation is described.

60236 **(FRNC-TH—1049) Effect of irradiation and of cysteamine on rat liver mitochondria.** Braquet, M. (Paris-5 Univ., 75 (France)). Jun 1979. 158p. (In French). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780664.

Thesis.

The aim of this work was to determine: the effects of a cobalt 60 gamma irradiation received by an animal, the biological repercussions of the preliminary administration of cysteamine to the animal exposed. To this end the amount of damage caused by in vivo irradiation of rats was estimated at three levels: on the whole body; on an important organ, the liver; on a specific organite, the mitochondrion. The methods of investigation used fall mainly within the province of biochemical technology. Studies on the effects of ionizing radiations on rats irradiated for ten days at 900 roentgens showed a generalized attack on the whole system, known as the "Acute Irradiation Syndrome" and divisible into three phases: stage one, initial phase involving loss of weight and destruction of the liver. These symptoms appear early and reach a paroxysm on the 4th day after irradiation. Stage two, remission phase (from the 5th to the 8th day) when the weight variations become stabilised. Stage three, last phase, often leading to the death between the 9th and 10th days. During the same 10-day period, on the same irradiated rats, the changes in enzymatic systems were followed in order to estimate the magnitude of peroxidative phenomena within a subcellular particle such as the mitochondrion. The results obtained prove a strong disorganisation of the mitochondrial function.

60237 **(FRNC-TH—1051) Effect of rat whole-body irradiation on oxidase chain and glucose-6-phosphatase of liver microsome: influence of cysteamine.** Bernard, P. (Paris-11 Univ., 91 - Orsay (France)). Nov 1979. 120p. (In French). NTIS (US Sales Only), PC A06/MF A01. Order Number DE828780665.

Thesis.

Three enzymatic systems of the male rat liver endoplasmic reticulum were studied by biochemical methods. Two means of investigation were used: - whole-body irradiation of the animal, - administration of cysteamine. The results obtained are discussed, in view of the functioning of these enzymatic systems, from two viewpoints: - the study of enzymatic radiolesions in relation to the radiobiological effect on the animal, the organ and the sub-cellular organite, - the study of chemical radioprotection. After a 900 R whole-body gamma irradiation a severe drop was observed in the enzymatic activity of two essential elements of the microsome oxydase chain: NADPH cytochrome P450 reductase and ethylmorphine N-demethylation. Glucose 6 phosphatase is also impaired by irradiation. Here it seems that the microsomal protein fraction could be responsible for the change in the enzyme activity. The irradiation effect is therefore not specific to one enzyme. The changes in these enzymatic activities correspond to the different phases of the acute irradiation syndrome which also affects the weight of the experimental animal and of the organ studied. Cysteamine used under chemical radioprotection conditions was found to be especially useful as a means of investigation complementary to the study of enzymatic radiolesions. From the combined action of irradiation and of the radioprotector it was possible to obtain a partial idea of the mechanisms of these radiolesions.

60238 **(FRNC-TH—1060) Physiological and biochemical aspects of the effect of ionizing radiations on the lung parenchyma.** Pasquier, C. (Centre de Recherches du Service de Sante des Armees, 75 - Paris (France)). Mar 1975. 138p. (In French). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780668.

Concerning the biochemical reactions of the lung parenchyma to irradiation the following points have been developed. Role of biochemically active substances (histamine, serotonin, kinins, catecholamines, prostaglandins) in the early reaction of the lung to irradiation, their common feature being their vascular impact point. Lung irradiation and lipids (fatty acids and lipid metabolism in general); irradiation, by raising the proportion of unsaturated at the expense of saturated fatty acids, may give rise to serious physiological respiratory disorders. Lung irradiation and blood fluidity (fibrinolytic activity, heparin, platelet factors). Pulmonary interstitium and irradiation (of the three interstitium components collagen plays a preferential part). Irradiation and immunological lung reaction (reasons behind the immunological theory, immunological assistance, immunological mechanism of pulmonary reactions towards pollutants). Enzymatic lung radiolesion indicators. Three kinds of physiological changes have been considered. Vascular physiology disturbances caused by the initial biochemical reactions; anomalies of

physiological or functional trials, images of the lesion formed; disorders of the cell physiology of carcinogenesis.

60239 **(INIS-mf—7077) Investigations by gamma spectrometry and histoautiography of the biokinetics of colloidal $^{233}ThO_2$ ('Thorotrast').** Foell, U. (Freie Univ. Berlin (Germany, F.R.). Klinikum Steglitz). 24 Feb 1978. 73p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780669.

Thesis.

Experiments were carried out in mice in order to determine activity ratios and distribution kinetics of ThO_2 and its decay products. The data will be used as a basic for dose calculations. In supplementary investigations, the microdistribution, localisation, and quantitative enrichment of thorotrast were determined in order to provide a basis for microdosimetric evaluation of late thorotrast lesions. The radioactive colloid was injected intravenously into the tail vein of the animals (25 to 250 μl). Whole-body activity was measured at regular intervals. The animals were killed at different times after incorporation, and their livers, spleens, and skeleton without bone marrow were investigated by gammy spectrometry and histoautoradiography. With the findings obtained for the macroscopic distribution of colloid $^{233}ThO_2$ and its decay products on the cellular level as a function of the duration of thorotrast storage, the mean radiation exposure of RHS organs can be determined and at least the order of magnitude of the local dose can be estimated. It will require long-term animal experiments to determine the biological effects of thorotrast incorporation and correlate them with the results of these dose calculations on the basis of the studies on thorotrast biokinetics.

60240 **(INIS-mf—7078) Effects of whole-body irradiation on the degradation of ^{125}I insulin and $Na^{131}I$ insulin in rabbits.** Hofmann, M. (Tuebingen Univ. (Germany, F.R.). Medizinische Fakultaet). 1980. 68p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780666.

Thesis.

The degradation of simultaneously (i.v.) injected $Na^{131}I$- and ^{125}I-bovine insuline by rabbit blood and the urinary excretion of $Na^{131}I$- and ^{125}I-containing insulin degradation products have been investigated before and 24 h after 700 R X-ray irradiation. Also, the distribution of the two substances in the livers, kidneys, spleens, and KI-blocked thyroids was observed after irradiation. Radiation effects on the distribution of $Na^{131}I$- and ^{125}I-insulin on the livers, kidneys, and spleens of rabbits were not observed. On irradiation, there was a significant reduction of diuresis and also of the urinary excretion of ^{131}I and ^{125}I radioactivity. Irradiation had no influence on the distribution of $Na^{131}I$-and ^{125}I-insulin between plasma and extravascular space. The renal excretion function for water, iodide, and insulin degradation products was clearly impaired after irradiation. The same applies to the insulincatabolism by the degrading organs. The leukocyte count was reduced to about 17% during the first 4 days after irradiation.

60241 **(INIS-mf—7086) Effects of renal shielding on the degradation of ^{125}I-insulin and $Na^{131}I$ in rabbits exposed to X-rays.** Hinderer, J.M. (Tuebingen Univ. (Germany, F.R.). Medizinische Fakultaet). 1980. 80p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780667.

Thesis.

The metabolism of simultaneously injected $Na^{131}I$ and ^{125}I bovine insulin was investigated in 12 rabbits before and after whole-body exposure to 700 R X-rays, with the kidneys shielded by a lead plate. The following parameters were measured: a) Degradation of ^{131}iodide, b) Degradation of the total ^{125}I radioactivity in the blood, c) Degradation in the blood of the ^{125}I radioactivity precipitable with trichloraecetic acid, d) Elimination with urine of ^{131}I and ^{125}I, e) Radioactivity concentrations in the livers, kidneys, spleens, and thyroid glands of irradiated animals only, f) Blood leukocyte count. The following results were obtained: 1) The distribution of $Na^{131}I$ and ^{125}I-insulin between plasma and extravascular space and the cell uptake of these substances remained unchanged on irradiation. 2) The renal insulin catabolism and the renal excretion function for water, iodide, and insulin degradation products remained unchanged while insulin degradation by the other organs was significantly delayed. 3) The delayed insulin catabolism is assumed to be due to radiolesions of the liver. 4) There was no effect of X-ray exposure on the distribution of $Na^{131}I$ and ^{125}I-insulin on the liver, kidneys, and spleen. 5) Blood leukocyte counts decreased rapidly directly after irradiation and had reached a constant 11% of the initial level at four days p.r. on an average.

60242 **(NUREG—0714-Vol.1) Occupational radiation exposure. Twelfth annual report, 1979.** Brooks, B.; McDonald, S.; Richardson, E. (Nuclear Regulatory Commission, Washington, DC (USA). Office of Resource Management). Aug 1982. 106p. GPO $5.50.

This report summarizes the occupational exposure data that is maintained in the US Nuclear Regulatory Commission's Radiation Exposure Information and Reports System (REIRS). This report is usually published on an annual basis and is available at all NRC public document rooms. The bulk of the information contained in the report was extracted from annual statistical reports submitted by all NRC licensees subject to the reporting requirements of 10 CFR 20.407. Four categories of licensees - operating nuclear power reactors, fuel fabricators and reprocessors, industrial radiographers, and manufacturers and distributors of specified quantities of byproduct materials - also submit personal identification and exposure information for terminating employees pursuant to 10 CFR 20.408, and some analysis of this data is also presented in this report.

60243 **(NUREG—0855) Health physics appraisal program. Technical report.** Cunningham, L.J.; Wigginton, J.E.; Flack, E.D. (Nuclear Regulatory Commission, Washington, DC (USA). Office of Inspection and Enforcement). Mar 1982. 105p. NTIS, PC A06/MF A01.

The accident at Three Mile Island in March 1979 and subsequent investigations identified, among other items, serious concerns involving several aspects of the radiation protection program. Significantly, some concerns involved areas not addressed by regulations or facility technical specifications. This in turn led to initiation of a major effort to evaluate the adequacy and effectiveness of radiation protection programs at all currently operating nuclear power facilities during calendar year 1980 by the Office of Inspection and Enforcement (IE), Nuclear Regulatory Commission. This inspection effort was termed an appraisal since it was structured to facilitate an integrated look at the total radiation protection program, delve into matters for which explicit regulatory requirements did not exist, and emphasized evaluation of capability and performance rather than compliance with regulations. This report discusses the results of the 48 appraisals and the anticipated regulatory actions that may be taken to further address the concerns.

60244 **(NUREG—0883) Uranium-mill appraisal program.** Everett, R.J.; Cain, C.L. (Nuclear Regulatory Commission, Arlington, TX (USA). Region IV). Aug 1982. 29p. GPO $4.50.

The results of special team appraisals at NRC-licensed uranium mills in the period May to November 1981 are reported. Since the Three Mile Island accident, NRC management has instituted a program of special team appraisals of radiation protection programs at certain NRC-licensed facilities. These appraisals were designed to identify weaknesses and strengths in NRC-licensed programs, including those areas not covered by explicit regulatory requirements. The regulatory requirements related to occupational radiation protection and environmental monitoring at uranium mills have been extensively upgraded in the past few years. In addition, there was some NRC staff concern with respect to the effectiveness of NRC licensing and inspection programs. In response to this concern and to changes in mill requirements, the NRC staff recommended that team appraisals be conducted at mills to determine the adequacy of mill programs, the effectiveness of the new requirements, and mill management implementation of programs and requirements. This report describes the appraisal scope and methodology as well as summary findings and conclusions. Significant weaknesses identified during the mill appraisals are discussed as well as recommendations for improvements in uranium mill programs and mill licensing and inspection.

60245 (ORNL/TM—8423) **Oak Ridge National Laboratory whole-body counter: internal operating procedure manual.** Berger, C.D.; Lane, B.H. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 60p. NTIS, PC A04/MF A01. Order Number DE82020483.

Portions of document are illegible.

The general purpose of the ORNL Whole Body Counter is to provide a rapid estimation of the type and quantity of radionuclide deposited in the human body. This report contains a review of the equipment in use at the facility and the procedure for its operation, the standard procedure for performing a routine whole body count, and a discussion of interpretation of results.

60246 (SSA—1981-TS-2, pp 491-493) **Effect of gamma radiation on cell growth of "Catharanthus Roseus" in solid culture media.** Courtois, D.; Neveux, Y.; Drouet, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60247 (SSA—1981-TS-2, pp 98-102) **Variations of blood plasma volume and whole blood volume after gamma irradiation in the rat.** Thiriot, C.; Momboisse, J.C.; Kergonou, J.F.; Rocquet, G. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiochimie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60248 (SSA—1981-TS-2, pp 103-105) **Study of germ cell mitotic cycle during perinatal radiosensitive period in the rat.** Coffigny, H. (Centre de Recherches du Service de Sante des Armees, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)); Pasquier, C. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60249 (SSA—1981-TS-2, pp 105-106) **Modifications of rat brain nucleotides after 30 grays whole body irradiation.** Nouaille Degorce, J.; Bourguignon, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60250 (SSA—1981-TS-2, pp 107-110) **Changes in free amino acids after irradiation: physiological rate in the various brain structures.** Nouaille Degorce, J.; Martin, C.; Volmant, J.P. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60251 (SSA—1981-TS-2, pp 114-118) **Qualitative modification of plasma haptoglobin after "in vivo" irradiation in the rat. Preliminary results of bidimensional immuno-electrophoresis analysis.** Dubos, M.; Landon, P.; Sperber, G.; Drouet, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60252 (SSA—1981-TS-2, pp 118-121) **Long term qualitative and quantitative evolution of spleen parenchyma in monkey irradiated with a dose about LD 50/30 days.** Sarsat, J.P.; Neveux, Y.; Drouet, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60253 (SSA—1981-TS-2, pp 121-124) **Effects of whole-body irradiation on microsomal enzyme system and cytochrome P-450 of rat liver.** Zajac, J.M.; Bernard, P. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiochimie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60254 (SSA—1981-TS-2, pp 125) **Effect of whole-body gamma irradiation on lipid peroxidation in rat tissues.** Kergonou, J.F.; Bernard, P.; Braquet, M.; Rocquet, G. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiochimie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60255 (SSA—1981-TS-2, pp 125-129) **Influence of "in vivo" gamma irradiation on Red Ox system of erythrocyte glutathione in the rat.** Thiriot, C.; Kergonou, J.F.; Terracole, D.; Rocquet, G. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiochimie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60256 (SSA—1981-TS-2, pp 129-131) **Cell kinetics of the bone marrow of rats exposed to 800 R and 1000 R gamma irradiation (flow cytometry).** Nicolas, J.; Birlouez, E.; Drouet, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60257 (SSA—1981-TS-2, pp 132-134) **Skin fluxmetry and thermometry in burned rats and in irradiated burned rats.** Rouif, J.; Delafontaine, J.M.; Chevalier, M.; Rauzier, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60258 (SSA—1981-TS-2, pp 134-138) **Anatomicopathological and clinical study of irradiated monkey undergoing partial ileectomy.** Neveux, Y.; Sarsat, J.P.; Nicolas, J.; Sperber, G.; Dubos, M.; Perrier, P.; Drouet, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60259 (SSA—1981-TS-2, pp 179-180) **Radioprotective action of liposome encapsulated cysteamine after oral administration in mice.** Roman, V.; Bocquier, F.; Leterrier, F.; Fatome, M. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60260 (SSA—1981-TS-2, pp 181-182) **Action of whole-body irradiation and radioprotective action of cysteamine on serum creatine phosphokinase isoenzyme activity.** Juille, H.; Fatome, M. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection); Martin, J.; Lafargue, P. (Hopital d'Instruction des Armees Percy, 92 - Clamart (France)). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

60261 (SSA—1981-TS-2, pp 182-186) **Influence of cephalic irradiation and of cysteamine on mice brain electric activity. Results during 1980.** Fatome, M.; Plou, P. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60262 (SSA—1981-TS-2, pp 189-190) **Evolution of serum biochemical syndrome in monkeys undergoing irradiation and enterectomy and enterally reanimated. I. Lipids and lipoproteins.** Sperber, G.; Nicolas, J.; Dubos, M.; Neveux, Y.; Drouet, J.; Lafargue, P. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60263 (SSA—1981-TS-2, pp 191-193) **Evolution of serum biochemical syndrome in monkeys undergoing irradiation and enterectomy and enterally reanimated. II. Serum proteins.** Sperber, G.; Nicolas, J.; Neveux, Y.; Dubos, M.; Drouet, J.; Lafargue, P. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60264 (SSA—1981-TS-2, pp 193-196) **Early skin autograft in burned rats exposed or not to 7,5 GY irradiation.** Monpeyssin, M.; Neveux, Y.; Drouet, J. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Biologie Generale et Ecologie). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60265 (SSA—1981-TS-2, pp 326-328) **Application of electroretinogram to laser dazzling. Preliminary report.** Bagot, J.D.; Courant, D.; Court, L. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60266 (SSA—1981-TS-2, pp 352-357) **Influence of irradiation on brain circulation of the "cynomologus" monkey (Macaca irus).** Mestries, J.C. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60267 (SSA—1981-TS-2, pp 539-542) **Modifications of enzyme activity in the rat after thermal burns associated with radiation exposure.** Rouif, J.; Rauzier, J.; Chevalier, M.; de La Fontaine, J.M. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60268 (SSA—1981-TS-2, pp 567-571) **Evoked responses and hyppocampal unitary activities during early radioinduced hyperventilation.** Touchard, F.; Bassant, M.H.; Court, L. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60269 (SSA—1981-TS-2, pp 537-539) **Thermal fluxmetry in local high dose irradiation.** Rouif, J.; Parmast, B. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60270 (SSA—1981-TS-2, pp 187-188) **Application of new ways of effective dose evaluation to a case of internal contamination.** Fatome, M.; Perles, R. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).
In 1980 Scientific works.

60271 **(UCRL—53301) Plutonium-aerosol emission rates and human pulmonary deposition calculations for Nuclear Site 201, Nevada Test Site.** Shinn, J.H.; Homan, D.N. (Lawrence Livermore National Lab., CA (USA)). 21 Jun 1982. Contract W-7405-ENG-48. 21p. NTIS, PC A02/MF A01. Order Number DE82020491.

This study determined the plutonium-aerosol fluxes from the soil to quantify (1) the extent of potential human exposure by deep-lung retention of alpha-emitting particles; (2) the source term should there be any significant, long-term, transport of plutonium aerosols; and (3) the resuspension factor and rate so that, for the first time at any nuclear site, one may calculate how long it will take for wind erosion to carry away a significant amount of the contaminated soil. High-volume air samplers and cascade impactors were used to characterize the plutonium aerosols. Meteorological flux-profile methods were used to calculate dust and plutonium aerosol emission rates. A floorless wind tunnel (10-m long) was used to examine resuspension under steady-state, high wind speed. The resuspension factor was two orders of magnitude lower than the other comparable sites at NTS and elsewhere, and the average resuspension rate of 5.3×10^{-9}/d was also very low, so that the half-time for resuspension by wind erosion was about 36,000 y.

60272 **Measurement and interpretation of the dose equivalent index.** Armantrout, G.A. (Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94550.). *Transactions of the American Nuclear Society;* **41**: 236(Jun 1982). (CONF-820609—).
From American Nuclear Society annual meeting; Los Angeles, CA, USA (6 Jun 1982).

60273 **Mutation induction by monochromatic 254-nm and 365-nm radiation in strains of Escherichia coli that differ in repair capability.** Webb, R.B.; Turner, M.A. (Argonne National Lab., IL). *Mutation Research;* **84**: 227-237(1981).
Mutation to tryptophan independence after exposure to radiation at the monochromatic wavelengths of 254 and 365 nm was studied and compared in 7 strains of Escherichia coli B/r that differ in repair capability. Efficient mutation induction was obtained with both 254-nm and 365-nm radiation with strains WP2 (wild-type), WP2s (uvrA), WP6 (polA), and WP6s (polA uvrA). Mutants were not induced at either wavelength in the lexA strain WP5 or the recA strains WP10 and WP100. These results support the induction of mutants with 365-nm radiation through the error-prone (SOS) pathway of postreplication repair. (JMT)

5602 Thermal Effects

REFER ALSO TO CITATION(S) 59880

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 59219, 59219, 59219, 60150, 60161, 60173, 60174, 60175, 60176, 60189

60274 **(DOE/EV/03571—T1) Biological effects of DNA repair, including mutagenesis. Progress report, May 1, 1981-August 15, 1982.** Hutchinson, F. (Yale Univ., New Haven, CT (USA)). 1982. Contract AC02-76EV03571. 8p. (COO—3571-22). NTIS, PC A02/MF A01. Order Number DE82020781.

Research was concentrated on the mechanisms of mutagenesis induced by selected agents, and on the repair of DNA double-strand breaks. The central project is one in which lambda bacteriophages are mutagenized with an agent, clear plaque mutations in

the CI gene mapped by genetic crosses, and the DNA in the appropriate restriction fragments sequenced to determine the changes in base sequence. (ACR)

60275 **(DOE/EV/04329—T1) Impact of atmospheric SO_2 and CO_2 on the ecophysiology and competitiveness of plants. Comprehensive technical progress report (1977-1980) and renewal proposal (1981-1984).** Bazzaz, F.A. (Illinois Univ., Urbana (USA). Dept. of Botany). Aug 1980. Contract AC02-77EV04329. 37p. NTIS, PC A03/MF A01. Order Number DE82021812.

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The following studies are reported: construction and operation of growth cabinets; design, construction and operation of CO_2 and SO_2 controllers; differential response of species to elevated CO_2 concentrations - growth, photosynthesis, and transpiration and water use efficiency; response of plants to elevated SO_2 and CO_2; and, changes in competitive interactions of species under elevated CO_2 concentrations. Results indicated that for many species (crops, trees, and weeds), an increase in the atmospheric CO_2 concentration may lead to an increase in plant growth. The response appears to be curvilinear with an upper asymptote that is probably not much above 1200 ppM. It was also determined that elevated CO_2 concentrations can change competition between species. (JGB)

60276 **(DOE/EV/70288—T1) Effects of atmospheric H_2S on vegetation. Final report, September 1, 1978-February 28, 1981.** Thompson, C.R. (California Univ., Riverside (USA). Statewide Air Pollution Research Center). 22 Apr 1981. Contract AT03-76EV70288. 92p. NTIS, PC A05/MF A01. Order Number DE82018424.

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The three sections of the report were abstracted and indexed separately for EDB/ERA. (JGB)

60277 (DOE/EV/70288—T1, pp 6-24) **Effects of ambient levels of H_2S and SO_2 on grapes, pears and walnuts.** 22 Apr 1981. NTIS, PC A05/MF A01.

In Effects of atmospheric H_2S on vegetation. Final report, September 1, 1978-February 28, 1981.

Two varieties of grapes, Cabernet Sauvignon and White Riesling, plus Bartlett pears and English walnuts, all of which are grown near The Geysers, California were grown in greenhouses for two seasons and treated with clean air, ambient levels of H_2S, 3 x ambient levels and amounts of SO_2 equivalent to the 3 fold levels. The ambient levels were the highest measured diurnal levels occurring near The Geysers. These amounts were metered into the greenhouses and varied hourly to simulate the ambient conditions in the field. The grapes were measured by linear growth of main canes plus laterals, dry weight of seasons growth, dry weight of leaves, number of flower clusters and percent sugar in grapes. Pears and walnuts were evaluated similarly but no measurements were made on fruit. No deleterious foliar symptoms or effects on growth parameters were observed which could be ascribed to the treatments. The only statistically valid effect was a growth stimulation with walnuts. Emissions of H_2S in this area or its oxidation product are presently considered to have no measurable effects on these crops.

60278 (DOE/EV/70288—T1, pp 25-49) **Effects of increasing atmospheric H_2S and soil sulfate on lettuce, corn and sugar beets.** 22 Apr 1981. NTIS, PC A05/MF A01.

In Effects of atmospheric H_2S on vegetation. Final report, September 1, 1978-February 28, 1981.

Lettuce, corn and sugar beets were grown in air conditioned greenhouses with 0.67, 1.49 and 8.87 me/l of soluble soil sulfate and 0, 30, 100 and 300 (ppB) of atmospheric H_2S. Studies were made on whether H_2S taken up to a greater extent from the atmosphere than from roots and the effects of sulfate on plant growth. Studies were also conducted to determine if increased sulfate in the root zone increases the degree of injury caused by high levels of H_2S and if H_2S fumigation stimulates plant growth when roots are supplied with optimum or greater than optimum levels of sulfate in the nutrient solution. The results show that increasing the levels of sulfate had very minor effects on plant performance. Fumigation with H_2S on lettuce with either 30 or 100 ppB had no effect on dry weight or percent dry weight but 300 ppB reduced dry weight considerably and increased percent dry weight to a lesser degree. Growth as measured by dry weight of corn was little affected by sulfate in the nutrient solution and H_2S fumigation at 300 ppB had little effect as compared to controls. There seemed to be a reduction in percent dry matter with 100 and 300 ppB H_2S but corn was relatively unaffected by H_2S fumigation. Growth of sugar beets was likewise little affected by increasing levels of sulfate. Fumigation with H_2S stimulated growth at both 30 and 100 ppB in young plants but reduced growth with 300 ppB. At final harvest 30 ppB increased beet root weight about 7.5% but 100 and 300 ppB reduced fresh weight 13 and 26%, respectively.

60279 (DOE/EV/70288—T1, pp 50-74) **Effects of H_2S on water-extractable sulfhydryl content of plants, on photosynthetic electron transport and on ribulose bisphosphate carboxylase.** deKok, L.J. (Rijksuniversiteit, Groningen, Netherlands); Thompson, C.R. 22 Apr 1981. NTIS, PC A05/MF A01.

In Effects of atmospheric H_2S on vegetation. Final report, September 1, 1978-February 28, 1981.

Fumigation of plants with H_2S resulted in growth inhibition. At the same time an increased water-extractable sulfhydryl-compound content was observed. Sulfhydryl content could increase more than ten-fold at 300 ppB H_2S. The H_2S-induced increase in sulfhydryl content was noted during the entire fumigation period, even though aging caused a decrease in the actual sulfhydryl content. The increase in sulfhydryl content was not due to an increased sulfide content of the tissue. Photosynthetic electron transport was inhibited at high concentrations of sulfide. This inhibition was most likely on the site of ferredoxin-$NADP^+$-reductase. When anthraquinone sulfonic acid was used as an electron acceptor, O_2-uptake was stimulated by sulfide. A partial inactivation of photo-electron transport by Tris could be reversed by sulfide. It was proposed, that a superoxide radical-mediated photooxidation of sulfide was responsible for these phenomena. Sulfide-induced O_2 uptake by illuminated chloroplasts in the absence of an electron acceptor. ADP stimulated this uptake. Photosystem II was not involved in this electron transport. Ribulose bisphosphate carboxylase activity of spinach chloroplasts was not affected by sulfide.

60280 (GSF-OE—599, pp 183-199) **Experience gained with ring investigations on biodegradation and photochemical degradation with international participation.** Rohleder, H. Mar 1981. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

From Colloquium 1980 of the GSF Institut fuer Oekologische Chemie; Neuherberg, Germany, F.R. (11 Nov 1980).

4 ring tests are briefly presented which were carried out in the EC and OECD countries to harmonize the test methods for biodegradation and photochemical degradation. The ring tests had a manifold effect: The methods were performed and tested in many laboratories and had a trigger-effect on the methods applied in practice. The test guidelines were tested under realistic conditions. They were improved upon also regarding evaluation. The political problem of harmonizing on the basis of scientific knowledge remains. The test methods for biodegradation and photochemical degradation are not yet fully developed. They can still be simplified, improved upon and reduced in number.

60281 **(INFN/TC—81/11) Development of tests for proton instrumental and radiochemical activation at the Milan AVF cyclotron.** Birattari, C.; Bonardi, M.; Gilardi, M.C. (Istituto Nazionale di Fisica Nucleare, Milan (Italy)). 10 Jun 1981. 34p. (In Italian). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82903260.

Portions of document are illegible.

A study is made of the use of radioisotopic bismuth from the Milan University AVF cyclotron in order to determine the amount of lead in human blood serum. Tabulated data are given on radiation sequence, gamma emission, lead target values, calibration of biological standards for lead content, and sensitivity curves for the method employed. An illustration is presented of the apparatus used for vapor dissolution of biological specimens. The radiochemical procedure described was found to be suitable for measuring Pb, Zn, Tl, Ge, Au, and Fe. 26 references, 17 figures, 9 tables.

60282 **(LA-UR—82-2300) Long-term exposure of Syrian hamsters and Osborne-Mendel rats to aerosolized 0.45-μM mean-diameter fibrous glass.** Smith, D.M.; Ortiz, L.W.; Archuleta, R.F. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 26p. (CONF-820477—1). NTIS, PC A03/MF A01. Order Number DE82021923.

From World Health Organization symposium on biological effects of man-made mineral fibers; Copenhagen, Denmark (20 Apr 1982).

Portions of document are illegible.

Male Syrian hamsters and female Osborne-Mendel rats were exposed for 24 months to one of two levels of an aerosolized fine-diameter fibrous glass (0.45-μm mean diameter). The high-level exposure had a mass concentration of ~ 3 mg/m³ (3000 fibers/cm³) and the low-level exposure, ~ 0.3 mg/m³ (300 fibers/cm³). At the higher level, approximately 500 fibers/cm³ were longer than 10 μm. After the 24-month exposure, the animals were maintained for the rest of their lives. Sham and unmanipulated cage controls were included for each species. No significant detrimental biological effects were observed in the hamsters. In fact, the exposed hamsters significantly outlived both the sham and cage controls. Several of the rats in the study are still alive. To date, no unusual changes have been observed in either pulmonary or extrapulmonary tissues of the rats.

60283 **(PB—82-172917) Acetone: development of a biologic standard for the industrial worker by breath analysis.** Stewart, R.D.; Hake, C.L.; Wu, A.; Graff, S.A.; Forster, H.V. (Medical Coll. of Wisconsin, Milwaukee (USA). Dept. of Environmental Medicine). Jun 1975. 86p. NTIS, PC A05/MF A01.

In order to determine physiological responses and develop a practical biological test to indicate the magnitude of industrial exposure to acetone (67641), 20 healthy adults of both sexes were exposed to known concentrations of acetone vapor in a controlled environment chamber. Exposures consisted of both steady, nonfluctuating vapor concentrations and widely fluctuating vapor concentrations. Male subjects were exposed to acetone vapor concentrations of 0, 200, 1000, and 1250 ppm for periods of 3 or 7.5 hr. Blood samples were taken. Various neurological and physiological tests were performed. Highly reproducible breath decay curves were obtained. Minimal variations in range of acetone in breath in identically exposed groups indicated breath analysis to be a rapid method for detection of the magnitude of recent acetone exposure and provides a biologic threshold-limit. Repetitive exposure to the current threshold-limit-value (TLV) of 1000 ppm produced no serious health responses in healthy subjects. Changes observed in the visual evoked response of males given 1250Oppm and the possible effect of 1000 ppm on the menstrual cycle indicate that the current TLV may not afford a substantial safety margin.

60284 **(PB—82-189317) Chalk Point cooling tower project: cooling tower effects on crops and soils. Post operational report No. 6. Final report.** Mulchi, C.L. (Maryland Univ., College Park (USA). Water Resources Research Center). Jul 1981. 61p. NTIS, PC A04/MF A01.

This report contains information obtained from dustfall collectors and soil samples taken at distances of 1.6, 4.8 and 9.6 km and in north, east, south and west directions from the Chalk Point Generation Station during the 6th year of operations for the Unit. No. 3 natural-draft cooling tower. The dustfall information summarized includes data on water insoluble particulates and sodium and chloride deposition rates expressed on a monthly basis. The soils information presented includes pH, electrical conductivity and extractable P, K, Ca, Mg and Na. Information from the current monitoring period (April, 1980 through March, 1981) was compared with data collected over the period April, 1973 through March, 1980.

60285 (SSA—1981-TS-2, pp 187) **Treatment of internal contamination: DTPA-Ca or DTPA-Zn.** Nouaille Degorce, J.; Mestries, J.C.; Pasquier, C. (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France). Div. de Radiobiologie et Radioprotection). Aug 1981. (In French). Dep. NTIS (US Sales Only).

In 1980 Scientific works.

57 HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 59950, 60161, 60203

60286 **(EDF-R—81H329994) Failure combination method: presentation, application to a simple collection of systems.** Llory, M.; Villemeur, A. (Electricite de France, 92 - Clamart. Direction des Etudes et Recherches). Nov 1981. 34p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702363.

The main advantages of this particular method for analyzing the reliability and safety of systems, the method of failure combinations, are presented. This is an inductive method of analysis; it makes it possible to pursue the Failure Modes and Effect Analysis (FMEA) until overall failures are obtained. In this manner, through an inductive approach all the combinations of failure modes leading to abnormal functioning of systems are obtained. It also makes it possible to carry out the overall study of complex systems in interaction and the systematic inventory of abnormal functioning of these systems, as from the failure modes of the components and their combinations. It can be used as from the design stages of systems and is an excellent dialogue tool between the various specialists concerned in problems of safety, operation and reliability.

60287 **(SAND—82-1370) Accommodation project for physically restricted personnel. Phase II. Low back project.** Young, L.L.; Mossman, P.B. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 17p. NTIS, PC A02/MF A01. Order Number DE82021121.

This report presents a course outline and its associated criteria for a Back Pain Prevention Program for Sandia National Laboratories.

60288 **(UCRL—50007-81) Hazards Control Department. Annual technology review, 1981.** (Lawrence Livermore National Lab., CA (USA)). 30 Jul 1982. Contract W-7405-ENG-48. 57p. NTIS, PC A04/MF A01. Order Number DE82020423.

This report is divided into three major sections. The first section covers the status of activities undertaken or continuing during the period; additional reports or separate publications will cover the final results of these activities. The second section contains reports on interesting activities of a more limited scope on which further reporting is not anticipated. The third section lists recent publications. Individual papers are included in the database.

60289 (UCRL—50007-81, pp 9-12) **Testing the performance of laminar-flow hoods.** Shishido, D.; Schweickert, G.J. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

Laminar-flow hoods are used extensively in the life sciences, electronics engineering, and other pursuits where cleanliness is paramount. Those used in the life sciences have established performance/safety standards; those used in the electronics manufacturing industry do not. Yet personnel and product protection are mandatory, for example, in fabricating microelectronic circuits - because of potentially hazardous chemicals and the need for absolute cleanliness. Using published methods, we tested various hoods to encourage establishment of a standard test so that users will understand the level of protection that this equipment provides.

60290 (UCRL—50007-81, pp 29-31) **Suppressing fires involving tapes and tape reels with portable fire extinguishers and room sprinklers.** Hasegawa, H.K.; Beason, D.G.; Leeds, S.G.; Foote, K.L. 30 Jul 1982. NTIS, PC A04/MF A01.

In Hazards Control Department. Annual technology review, 1981.

Because the Magnetic Fusion Energy (MFE) and main computer centers at LLNL have become increasingly concerned about the fire hazard of magnetic tape reels, we initiated a research program to evaluate this fire potential and the effectiveness of appropriate countermeasures. Our objectives were to test and evaluate the effects of using (1) a 17-lb Halon 1211 fire extinguisher, (2) a

15-lb carbon dioxide (CO_2) fire extinguisher, and (3) standard wet pipe sprinklers on a fire in a simulated tape-storage rack. We found little published information related to this topic, which is surprising since tape storage normally shares the same space with computers or occupies spaces which communicate with computer rooms; a fire in tape-storage must be rapidly extinguished before it damages sensitive electronics.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 59202, 59291, 59294, 59301, 59326

60291 (GSCan-P—80-1C, pp 149-151) **Radiocarbon dating of driftwood. Interlaboratory checks on samples from Nordaustlandet, Svalbard.** Blake, W. 1980. Dep. NTIS (US Sales Only).

In Current research. Part C.

An important facet of the work of any radiocarbon dating facility is the cross-checking of samples between laboratories. A log provides the best material for cross-checking purposes, as it is possible to supply identical samples to each laboratory. A number of samples of driftwood collected in northern Nordaustlandet, Svalbard were dated at Gakushuin University, Tokyo, and at the Geological Survey of Canada Laboratories; some of the wood had been dated previously in Uppsala. The GSC and Uppsala dates ranged between 6000 and 7000 years, while the Gakushuin dates varied over 3000 years. Most of the GSC and Gakushuin dates do not agree very well. Inter-laboratory checks like this one can help a laboratory pinpoint a source of error when the results do not agree.

60292 (INIS-mf—6828, pp 165-184) **Solid-state dosimetry applications: thermoluminescence dating, thermocurrent dosimetry.** Benkoe, L.; Biro, T.; Loerincz, A.; Patkai, G. (Magyar Tudomanyos Akademia Izotop Intezete, Budapest). 1980. (In Hungarian). Dep. NTIS (US Sales Only).

In Isotope applications research.

In the new TL method for the testing of authenticity of archaeological findings the fraction between 100-250 μm from the whole substance of the pottery is used. The mass of the sample being about 0.1 g the method entails a negligible destruction of the object. For the determination of absolute age the TL of quartz grains separated from the ceramic object is used. A TLD method for the measurement of internal dose rate was developed and supplemented with elemental analysis to raise accuracy (at present about 20%). The temporary change in the conductivity of the insulating materials under ionizing radiation and heating - the so-called thermocurrent (TC) effect - offer new possibilities for the dosimetry of ionizing radiations. From the practical point of view the TC dosimetry distinguishes itself by the simplicity of read-out and, consequently, by excellent reproducibility. The dose measurable by sapphire crystals ranges from 100 μGy to 10 Gy, so the method is hopeful in personal dosimetry, too. The only drawback is the high scattering of parameters of the samples measured.

60293 (LBL—14780) **Current status of the impact theory for the terminal Cretaceous extinction.** Alvarez, W.; Alvarez, L.W.; Asaro, F.; Michel, H.V. (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 36p. (CONF-8110141—3). NTIS, PC A03/MF A01. Order Number DE82020338.

From Conference on large body impacts and terrestrial evolution; Snowbird, UT, USA (18 Oct 1981).

Portions of document are illegible.

Iridium is depleted in the earth's crust relative to its normal solar system abundance. Several hundred measurements by at least seven laboratories have disclosed an iridium abundance anomaly at the Cretaceous-Tertiary (C-T) boundary in 36 sites worldwide. Discovery of the first iridium anomaly in non-marine sediments, by Charles Orth and his colleagues, shows that the iridium was not extracted from sea water. Sediment starvation and a nearby supernova have also been eliminated as possible sources. Impact of a large extraterrestrial object is now widely accepted as the best explanation of the iridium anomaly. Paleomagnetic reversal stratigraphy of four marine and five non-marine C-T boundary sections is consistent with simultaneous extinction worldwide, but does not prove it. Ultra-high-resolution stratigraphic studies at Caravaca, in southern Spain, by Jan Smit, give an unparalled record of the extinction of the planktic foraminifera and the associated geochemical patterns. Au/Ir and Pt/Ir ratios from two C-T boundary clays indicate a type I carbonaceous chondrite composition for the impacting object. Iridium anomalies are known from two other stratigraphic horizons, in each case associated with direct evidence for an extraterrestrial impact: in the Pliocene, with chondritic ablation debris, and in the late Eocene with microtektites. The C-T impact site has not been located. Two interesting candidate sites are the circular sea-floor features west of Portugal and the Deccan Traps of India. There is a 20% probability that impact occurred on sea floor that has subsequently been subducted. The killing mechanism has not yet been established, but both temperature changes and darkness due to atmospheric dust are probable contributors. Darkness would have lasted a few months, rather than our originally suggested few years.

60294 **(USGS-OFR—80-134) Status of geologic mapping in Alaska.** Bartsch-Winkler, S. (comp.). (Geological Survey, Denver, CO (USA)). Jul 1979. 22p. USGS Open File Service, Box 25425 Denver Federal Center, Denver, CO 80225.

A map is presented which shows the location of 104 sites in Alaska which have had geologic surveys performed since 1930. A list of the maps available for the individual sites, with specific data on the map date, person responsible for map publication, and name of mapped area is included. (LCL)

60295 **(USGS-OFR—81-555) Temperature-depth data for selected deep drill holes in the United States obtained using maximum thermometers.** Guffanti, M.; Nathenson, M. (Geological Survey, Washington, DC (USA)). 1981. 100p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

Temperature versus depth plots, calculated thermal gradients, and temperature logs are presented for 91 drill holes located in Alabama, Arkansas, California, Colorado, Illinois, Kansas, Louisiana, Michigan, Mississippi, Montana, New Mexico, New York, Oklahoma, Oregon, Pennsylvania, Texas, Utah, West Virginia, and Wyoming. These holes are selected from a much larger compilation of temperature data previously published by Spicer (1964). The selected subset consists of those holes that have been logged to depths generally greater than 600 m while at temperature equilibrium and that display conductive temperature gradients. Temperature gradients (°C/km) calculated for each hole were used as part of the data base to produce a contoured temperature-gradient map of the conterminous United States in Guffanti and Nathenson (1980).

5802 Geophysics

REFER ALSO TO CITATION(S) 59431

60296 **(LA—9467-PR) Earthquake catalog for northern New Mexico. Progress report for October-December 1981.** Cash, D.J.; Olsen, K.H.; McFarland, N.J.; Stewart, J.N.; Wolff, J.J. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 16p. NTIS, PC A02/MF A01. Order Number DE82021840.

This report is a summary of the earthquakes located in northern New Mexico by the Los Alamos National Laboratory seismic array. Data are presented in the form of tables and epicenter maps, with a brief explanatory text.

60297 **(UCID—19504) Nature of P waves at the RSTN station RSSD.** Taylor, S.R. (Lawrence Livermore National Lab., CA (USA)). 20 Aug 1982. Contract W-7405-ENG-48. 26p. NTIS, PC A03/MF A01. Order Number DE82021967.

The character of Pn waves recorded at the Regional Seismic Test Network (RSTN) station at South Dakota (RSSD) is investigated using synthetic seismograms. It is demonstrated that anomalous phase shifts and emergent features seen in the records at RSSD are caused by local and regional structure and not the station in-

strumentation. It is found that the presence of a thin (0.5 km) sedimentary layer can cause an apparent delay of the horizontal components relative to the vertical. This effect is caused by interference between the primary P arrival and a slightly delayed P to SV conversion. The emergent character of Pn arrivals at RSSD from NTS explosions is probably due to effects of Basin and Range structure along major portions of the travel path. The appearance of a large secondary arrival following the weak Pn onset by approximately 1.2 seconds may be another phase critically refracted from the base of the upper mantle low-velocity zone (LVZ). Synthetic seismograms illustrate that, for frequencies up to a few Hz, the waveforms for a surface receiver and one at 100m depth are quite similar, especially for the vertical components. For frequencies above 3 Hz, the differences observed on the radials become more significant. These results are substantiated by comparison of data from an NTS explosion at RSSD recorded at 100m and at the free surface.

60298 **(UCID—19505) Data analysis using multiple filters.** Nakanishi, K.K.; Burr, N.C. (Lawrence Livermore National Lab., CA (USA)). 25 Aug 1982. Contract W-7405-ENG-48. 17p. NTIS, PC A02/MF A01. Order Number DE82021948.

Several programs have been written for the OCTOPUS and LLNL Seismic Observatory's PRIME computer system. These programs are used to compute spectral amplitude as a function of time for various frequency bands, and to display the results using either contour levels or color graphics.

60299 **(USGS-OFR—81-236) Gas analyses of fumaroles from Mt. Hood, Oregon.** Nehring, N.L.; Wollenberg, H.A.; Johnston, D.A. (Geological Survey, Menlo Park, CA (USA); Lawrence Berkeley Lab., CA (USA)). 1981. 9p. USGS Open File Service, Box 25425 - Denver Federal Center, Denver, CO 80225.

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The eruptive activity of Mt. St. Helens beginning in March 1980, coupled with earthquake activity on Mt. Hood in early July, has generated increased interest in the fumaroles near the summit of Mt. Hood. These fumaroles are associated with Crater Rock, a hornblende dacite plug, extruded 200 to 300 years ago (Crandell, 1980). A major eruption in about 1700 and lesser eruptions in 1805, 1859, and 1865 (Harris, 1976) were centered near Crater Rock. It is likely that future eruptions will occur in this area. Changes in the surficial characteristics of the fumaroles or changes in the composition of the gas emitted by the fumaroles could precede an eruption by a sufficient length of time to help predict the eruption. In 1935, K.N. Phillips and G.R. Collins collected and analyzed the first samples of gases from the fumaroles (Phillips, 1936). F.D. Ayres and A.E. Creswell (1951) collected and analyzed gas samples from orifices they considered to be equivalent to those sampled by Phillips and Collins, and these (or orifices in the same area) were re-sampled in 1977 and 1978. The results of the 1978 sampling are presented.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 59163, 59294, 59301, 60145

60300 **(DOE/ER/10445—T1) Experimental study of opening-mode crack growth in rock. Progress report and renewal proposal.** Gordon, R.B. (Yale Univ., New Haven, CT (USA). Dept. of Geology and Geophysics). 1981. Contract AC02-79ER10445. 12p. NTIS, PC A02/MF A01. Order Number DE82021818.

The objective is to relate fracture toughness to rock microstructure. Crack propagation measurements are made on samples of stockbridge marble and Stony Creek granite. Force-displacement curves are recorded and the texture of the fracture surfaces observed. (ACR)

5804 Geochemistry

REFER ALSO TO CITATION(S) 59304

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

60301 **(AD-A—112214/2) Soft x-rays from the sunlit earth's atmosphere. Technical report.** McKenzie, D.L.; Rugge, H.R.; Charles, P.A. (Aerospace Corp., El Segundo, CA (USA). Space Sciences Lab.). 15 Feb 1982. 38p. NTIS, PC A03/MF A01.

The HEAO-1 A-2 experiment low-energy proportional counters, designed to investigate celestial X-ray sources, have been used here to measure the X-ray spectrum of the sunlit earth in the energy range 0.2-0.8 keV. The X-rays arise by coherent scattering of, or fluorescence of atmospheric constituents by, solar coronal X-rays incident on the atmosphere. Although the relative spectral contributions of the two processes depend upon the sun-earth-satellite geometry, fluorescent oxygen and nitrogen K X-ray emission is always important. The observed spectra were compared with calculations in order to derive the coronal temperature and emission measure, parameters that characterize the incident solar spectrum. These derived parameters agree well with the expected values for the nonflaring sun, and good agreement was obtained between measurements closely spaced in time but having a wide range of geometries and counting rates. Thus X-ray observations of the sunlit earth's atmosphere can be a useful monitor of solar activity for satellite-borne instrumentation unable to view the sun directly. The total measured fluorescent line flux agreed well with calculations, but the N/O line ratio did not. This disagreement is attributed to several causes, including the relative weakness of N emission at high altitudes where fluorescence is particularly important, the presence of line emission in the solar spectrum, and possible small calibration errors.

60302 **(DOE/ER/40048—5L2) Isotopic-abundance ratios and Dirac's large-numbers hypothesis.** Norman, E.B. (Washington Univ., Seattle (USA). Nuclear Physics Lab.). 1981. Contract AC06-81ER40048. 6p. NTIS, PC A02/MF A01. Order Number DE82020194.

One of the remarkable consequences of Dirac's Large-Numbers-Hypothesis (LNH) is that the number of nucleons in the universe is predicted to vary as t^2, where t is the age of the universe. Thus, new matter must be continuously created. The form in which this new matter might appear and where it might appear have been topics of discussion for some time. Recently, Shenkin has made the interesting suggestion that new matter may appear inside atomic nuclei in the form of neutrons. Shenkin examined the effect this process would have on the relative abundances of fluorine and neon in ancient rocks and concluded that intolerably high neon abundances would be the likely results. The purpose of this letter is to point out that the continuous creation of either neutrons or protons within atomic nuclei at the rates predicted by Dirac's LNH would have produced isotopic abundance ratios that are in serious disagreement with the observed values.

60303 **(EGG—1183-1836) Evolutionary models for SNI progenitor stars.** Colvin, J.D. (EG and G, Inc., Los Alamos, NM (USA)). 1982. Contract AC08-76NV01183. 6p. (CONF-820801—13). NTIS, PC A02/MF A01. Order Number DE82019939.

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Many researchers have proposed that the Type I supernova (SNI) explosion originates in a white dwarf (WD) star that is undergoing mass accretion from a companion star in a close binary orbit. Previous hydrodynamic computations by others have described the final result given the WD mass and composition (usually assumed uniform), the mass accretion rate, and the composition of the accreting matter. Unresolved by these computations, however, are the following questions: (1) how does a given WD evolve to a particular pre-explosion configuration in a realistic scenario; (2)

what is the most likely progenitor, hence explosion mechanism; (3) how can an accreting WD ever evolve to a SNI if it first ejects the accreted envelope in one or more nova outbursts; Starrfield, Truran, and Sparks (1981) have proposed, for example, that since at low mass accretion rates, gravitational settling of the CNO nuclei out of the accreted H envelope can occur on the accretion time scale, only steady-state hydrogen burning will occur, leading to no nova outburst. I have performed evolutionary calculations in an attempt to test the Starrfield, et al. suggestion and to clarify these questions. I discuss the details of these calculations, which are based on a variant of the Henyey method, and include the effects of mass accretion, convective mixing, nuclear burning, and gravitational settling. This is the first WD evolutionary calculation that includes all the physical effects thought to be responsible for the composition morphology, while making use of the best available equation of state for WD matter. I present preliminary results of this study, consisting of two evolutionary sequences resulting from spherically symmetric accretion of normal matter (X = 0.700, Y = 0.285) onto an initially pure ^{12}C WD of mass 1.00 M and initial luminosity given by log L/L = 3.74.

6402 Atmospheric Physics

REFER ALSO TO CITATION(S) 60301

60304 **(AD-A—112335/5) Excede support studies. Final report 15 May 80-15 Sep 81.** Zahniser, M.S.; Cheng, W.; Bien, F.; Lyons, R. (Aerodyne Research, Inc., Bedford, MA (USA)). 15 Sep 1981. 66p. (ARI-RR—269). NTIS, PC A04/MF A01.

Various aspects relating to the EXCEDE artificial aurora project are discussed: (1) Data from EXCEDE SPECTRAL in the 4.5 to 5 micrometers region taken by infrared circular variable filters is analyzed for emission from CO, N2O, and NO(+). The spectral band profile and altitude dependence of the 4.5 micrometers feature correlates with a model for NO(+) chemiluminescent emission. (2) A preliminary analysis of spectra in the 12 to 22 micrometers region shows CO2 nu 2 radiation at 15 micrometers to be the predominant feature. Altitude profiles for peaks at 14 and 16 micrometers are presented. (3) The flowfield for the hypersonic wake of the EXCEDE vehicle at lower altitudes is characterized. Intensity patterns in photographs taken with the on-board visible camera are explained in terms of bow shock and wake shock formation and a procedure is outlined for analyzing the radiometric data in terms of this effect. (4) The long lived electron beam-induced chemiluminescent trail of the Precede I experiment recorded from ground based photography has been analyzed for intensity and altitude distribution. The air afterglow reaction NO + O yields NO2 + h nu, from beam-produced NO and ambient atomic oxygen, is not sufficiently strong to account for the observed 10 k Rayleigh intensity.

60305 **(AD-A—112598/8) Beat excitation of whistler waves.** Shoucri, M.; Morales, G.J.; Maggs, J.E. (California Univ., Los Angeles (USA). Center for Plasma Physics and Fusion Engineering). Jan 1982. 26p. (PPG—609). NTIS, PC A03/MF A01.

This report provides a clear example of how the nonlinear efficiency for the radiation of a low frequency electromagnetic signal due to the beat of two high frequency pumps can be determined from first principles. The calculation includes plasma nonuniformity as well as finite spatial extent of the pumps. The figure of merit for the beat process is given by the compact expression. A rough order of magnitude evaluation of this expression shows a radiated power whose dependence on pump power scales as P sub R is equivalent to V sub os squared P sub p, where V sub S refers to the oscillating velocity of an electron due to the high frequency pump, and c is the speed of light. This dependence illustrates readily the extreme inefficiency of the process at low pump power (i.e., v sub os). Another fundamental factor which lowers the efficiency is that the coupling to the whistler wave occurs through electric dipole excitation. A more efficient excitation mechanism would be to use magnetic coupling, i.e., to generate a nonlinear transverse current oscillating at the beat frequency. However, within the constraints of the present geometry this more desireable situation cannot be realized directly. The most advantageous feature of the beat excitation described here is the controllability of the spatial location from which the whistler emanates.

60306 **(SAND—82-0635C) Real-time tracking and targeting computations and rocket-vehicle aeroballistics for the PLACES ionospheric-plasma test series.** Rollstin, L.R. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-821017—1). NTIS, PC A02/MF A01. Order Number DE82017623.

From 6. AIAA sounding rocket conference; Orlando, FL, USA (26 Oct 1982).

The PLACES (Position Location and Communication Effects Simulations) test program, conducted in December 1980 at Eglin Gulf Test Range, involved a series of ionospheric releases of barium/barium-nitrate vapor. The Defense Nuclear Agency sponsored program investigated effects of a structured ionospheric plasma (similar to that produced by a high-altitude nuclear explosion) on satellite navigation systems and provided in situ measurement of plasma structure. Terrier-Tomahawk rocket systems boosted the barium payloads, beacon payloads (plasma occultation experiment), and probe payloads (plasma in situ measurement). Drifting plasma tracking procedures, beacon-and probe-vehicle targeting procedures, and vehicle flight test results are presented.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 59635, 59841, 60069, 60071

60307 **(AD-A—112627/5) Physics of atomic frequency standards based on stimulated resonance Raman scattering.** Picard, R.H.; Willis, C.R. (Rome Air Development Center, Griffiss AFB, NY (USA)). Oct 1981. 32p. (RADC-TR—81-310). NTIS, PC A03/MF A01.

This report analyzes a novel technique developed at RADC for high-precision frequency standards operating in the microwave to far infrared regions of the spectrum. The technique is based on stimulated resonance Raman scattering of visible laser light in atomic or molecular beams; it does not require low frequency (microwave to far infrared) radiation to interact with the resonant species, and it is potentially capable of stabilities characteristic of low-frequency atomic standards.

60308 **(BNL—31681) Experiments with highly ionized low-energy tandem accel-decel beams.** Jones, K.W.; Johnson, B.M.; Meron, M.; Da-Hai, W.; Thieberger, P.; Barrette, J.; Schuch, R.; Schmidt-Boecking, H.; Tserruya, I.; Kruse, T.H. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 14p. (CONF-8206110—2). NTIS (US Sales Only). Order Number DE82020528.

From Symposium on production and physics of highly charged ions; Stockholm, Sweden (1 Jun 1982).

Portions of document are illegible.

The present status of the production of low-energy highly ionized beams by the 4-stage tandem accel-decel method is surveyed, and their use in three atomic physics experiments is summarized. The experiments are: the measurement of the charge state dependence of K-x-ray production in S/sup +q/-Ar collisions at 10 MeV, the impact-parameter dependence of quasimolecular x rays in S^{+15}-Ar collisions again at 10 MeV, and the determination of charge transfer cross sections in S/sup +q/ + Ar, He collisions. The results of the three experiments give evidence that the 4-stage accel-decel ion production technique is extremely powerful and useful.

60309 **(CONF-820853—3) Negative-ion states.** Compton, R.N. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 57p. NTIS, PC A04/MF A01. Order Number DE82020832.

From NATO conference on photophysics and photochemistry in the vacuum ultraviolet; Lake Geneva, WI, USA (15 Aug 1982).

In this brief review, we discuss some of the properties of atomic and molecular negative ions and their excited states. Experiments involving photon reactions with negative ions and polar dissociation are summarized. 116 references, 14 figures.

60310 **(CONF-820855—1) Collisionally excited few-electron systems: theoretical introduction and survey.** Ford, A.L.; Reading, J.F.; Becker, R.L. (Oak Ridge National Lab., TN (USA); Texas A and M Univ., College Station (USA)). 1982. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01. Order Number DE82020805.

From International conference on X-ray and atomic inner-shell physics; Eugene, OR, USA (23 Aug 1982).

We consider excitation, ionization, and charge transfer in collisions of protons (and antiprotons) with the single-electron targets H, He^+, and Li^{2+}. These collisions are first compared to other types of ion-atom collisions. A brief review of our own theoretical method is given; in particular we describe how we allow for both large charge transfer and ionization probabilities while retaining the computational efficiency that allows us to consider a variety of collision partners and collision energies. We comment on the comparison of our results to other theoretical work and to experiment. The qualitative features of the various inelastic cross sections are discussed, in particular how they scale with collision energy, target nuclear charge, and the sign of the projectile charge. 15 references, 6 figures.

60311 **(DOE/ER/01198—1387) X-ray-diffraction study of vacancies in bcc helium-3 and bcc helium-4.** Granfors, P.R. (Illinois Univ., Urbana (USA). Dept. of Physics). 1982. Contract AC02-76ER01198. 182p. NTIS, PC A09/MF A01. Order Number DE82020141.

Thesis.

Absolute lattice parameters in bcc ^{4}He crystals in contact with superfluid ^{4}He were measured in the temperature range 1.494 to 1.711°K, corresponding to molar volumes between 20.88 and 21.09 cm^3/mole. Vacancy concentrations at melting were estimated from a comparison of these lattice parameters with bulk volumes from the literature. The value of the free energy of formation for vacancies in bcc ^{4}He obtained from these measurements is f/sub v/ = 9+-1 K. Relation between this value and indirect inferences about vacancy formation from ion mobility and NMR is discussed. Comparisons are made between the formation free energy in bcc ^{4}He and the same quantity at the same molar volume in the extensively-studied bcc phase of ^{3}He. A systematic study of the temperature dependence of the lattice parameter in crystals of bcc ^{3}He with molar volumes between 23.35 and 24.80 cm^3/mole was made. Present measurements with an improved x-ray technique confirm previous x-ray measurements when simple exponentials are fitted to the data. Possible deviations from exponential activation of vacancies and their relationship to effects of a vacancy band are discussed. The difficulties encountered in this careful study using an improved x-ray system reemphasize the nontriviality of performing accurate diffractometry on crystals of bcc ^{3}He with large molar volumes.

60312 **(DOE/OR/05423—T1) Photon interactions with atoms and molecules. Final report.** (Rice Univ., Houston, TX (USA). Dept. of Space Physics and Astronomy). 1978. Contract AS05-77OR05423. 11p. NTIS, PC A02/MF A01. Order Number DE82020471.

Research is reported in measurement of absolute cross sections for the photoionization of heavy rare gas metastable atoms by use of a crossed beams technique. This effort included the development of a high power, pulsed, tunable ultraviolet and vacuum ultraviolet laser system. (GHT)

60313 (INIS-mf—7057, pp 34-36) **Positronium chemistry in porous adsorbents.** Foti, G.; Nagy, L.G.; Moravcsik, G. (Budapesti Mueszaki Egyetem (Hungary). Alkalmazott Kemiai Tanszek); Schay, G. (Magyar Tudomanyos Akademia Koezponti Kemiai Kutato Intezete, Budapest). 1981. (In Hungarian). NTIS (US Sales Only), PC A16/MF A01.

From Conference on colloid chemistry; Siofok, Hungary (13 Apr 1981).

Kinetic studies on the annihilation of orthopositronium in porous adsorbents have been performed using lifetime spectroscopy. The positron source applied was ^{22}Na with 0.2 MBq activity. The adsorbents investigated were silica gels of different particle size and pore structure. The appearance of the long-lived component in the lifetime spectra can be explained by the diffusion of the orthopositronium into the pores affected by the particle size and the pore size of the adsorbent, the coverage on it and the chemical nature of the adsorbate. The long-term aim of the work is to determine and to explain these effects.

60314 (INIS-mf—7057, pp 102-105) **Positron lifetime studies in aqueous SDS micellar solutions.** Kajcsos, Zs.; Molnar, B.; Vass, Sz. (Koezponti Fizikai Kutato Intezet, Budapest (Hungary)); Stergiopoulos, Ch. (Eoetvoes Lorand Tudomanyegyetem, Budapest (Hungary). Kolloid Kemiai es Kolloidtechnologiai Tanszek). 1981. (In Hungarian). NTIS (US Sales Only), PC A16/MF A01.

From Conference on colloid chemistry; Siofok, Hungary (13 Apr 1981).

The lifetime and decay intensity of o-Ps atoms are measured as a function of surfactant concentration. The increase of o-Ps lifetimes contradicts to the assumption that the electron conversion leading to o-Ps annihilation is a result of chemical reaction.

60315 **(ITF—80-133E) Solitons in quasi-one-dimensional molecular structures.** Davydov, A.S. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Dec 1980. 71p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

Investigation is made of solitons arising in quasi-one-dimensional molecular structures of the type of alpha helical protein molecules. The processes of deceleration of solitons by dissipative forces, the influence of thermal motion and external fields are investigated. It is shown that the vibrational energy of Amide-I vibrations in peptide groups can be transferred in the form of solitons through a protein molecule without losses. In this connection a new mechanism of muscular contraction in animals is proposed.

60316 **(ITF—81-4P) Davydov's splitting in one-particle spectra of β-GaSe.** Danilevich-Tovstyuk, K.K.; Bercha, D.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1981. 16p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The determination of the character of splitting between bands for β-GaSe is investigated (whether it is due to the interaction between layers, or to that within them). A group-theoretical criterion for the existence of Davydov's splitting between bands is derived. This treatment is shown to give additional information necessary for a proper choice of pseudopotential. Analysis of splitting for the phonon spectrum indicates that formation of GaSe modifications is possible through the relative shift of layers as a whole.

60317 **(ITF—82-47P) Ground state of H^- ion in the screened field.** Yukhnovsky, P.I.; Solov'yan, V.B. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 14p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

Using the three-parameter wave function the H^- ground state is investigated in the presence of the screened interaction between particles and the field of the metal electron plasma. The H^- ground state energy of such a field is shown to be lower than that of the atom H ground state.

60318 **(LA—9420-T) Rapid vibrational and rotational energy-transfer rates in heated carbon dioxide collisions by double-resonance laser spectroscopy.** Thomason, M.D. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 171p. NTIS, PC A08/MF A01. Order Number DE82021844.

Theses. Submitted to Univ. of Virginia, Charlottesville.

Rates for resonant vibrational and rotational energy transfer from the 001 state by CO_2 + CO_2 collisions have been measured. All data were obtained by double resonance spectroscopy with CO_2 lasers in a 2.5 meter absorption cell at 700°K. Results for rotation transfer include pumped-level relaxation and the response of other 001 levels with ΔJ up to 18. These data are compared to four relevant collision models via a 35-level rate equation analysis. Sequence-band (002 → 101) and hot-band (011 → 110) lasting have been used to observe resonant nu_3-transfer relaxation involving 001

+ 001 reversible 002 + 000, 001 + 100 reversible 101 + 000, and 001 + 010 reversible 011 + 000. A multilevel rate analysis has been utilized to determine the rate coefficients for 001 going to the 002, the 101, and the 011 levels. Part of the hot-band data has been interpreted as due to 110 + 000 reversible 100 + 010, and the associated rate constant has been estimated. The results of the study are compared to the theory and to other experiments.

60319 **(PB—82-187261) Separated-channel static-exchange calculations of the photoionization of the 1 π(g) orbital of O2.** Delaney, J.J.; Hillier, I.H.; Saunders, V.R. (Science and Engineering Research Council, Daresbury (UK). Daresbury Lab.). Oct 1981. 7p. (DL/SCI/P—306T). NTIS, PC A02/MF A01.

A calculation of the photoionizaton cross section of the 1 pi(g) orbital of molecular oxygen using the separated-channel static exchange approximations and a large, flexible Gaussian basis, is in excellent agreement with experimental measurements, in contrast to a previous calculation.

60320 **(UCRL—87983) Theoretical analysis of spectral lines of one- and two-electron ions in hot plasmas.** Rozsnyai, B.F.; Einwohner, T. (Lawrence Livermore National Lab., CA (USA)). 28 Jul 1982. Contract W-7405-ENG-48. 13p. (CONF-820732—2). NTIS, PC A02/MF A01. Order Number DE82020163.

From International union of pure and applied physics conference; Boulder, CO, USA (12 Jul 1982).

We discuss the line shapes for the 1s-2p, 1s-3p and $(1s)^2$ - 1s2p, $(1s)^2$ - 1s3p absorption lines in hot plasmas. In our model calculations the perturbing ions are considered quasi-static and widths due to collisions with electrons are calculated in the impact approximation. The collective effect of the plasma electrons is accounted for by a self-consistent model or by a simple Debye-Hueckel screening. These models in general predict different line shapes. We present calculations for the HeII, SiXIV and SiXIII ions.

60321 (INIS-mf—7127, pp vp) **Kinetics of ion-molecule reactions.** Calcote, H.F. (Aerochem Research Labs., Inc., Princeton, NJ (USA)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

60322 (IPNO—81-05, pp 30-47) **Cornel EBIS - A source for atomic physics experiment.** Kostrum, V.O.; Ghanbari, E.; Beebe, E.N.; Janson, S.W. (Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Studies). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

This source foreseen for atomic physics experiments uses an external electron gun, a distributed sputter ion pump and a microprocessor control of the axial trap voltage supplies.

60323 (IPNO—81-05, pp 48-58) **Frankfurt EBIS development.** Becker, R.; Kleinod, M.; Klein, H. (Frankfurt Univ. (Germany, F.R.). Inst. fuer Angewandte Physik). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Aims and results of the development of an electron beam ion source at Frankfurt are reported for the period between the 1. Workshop on EBIS 1977 and this workshop including first successful operation in 1980 and June of 1981.

60324 (IPNO—81-05, pp 263-278) **Collisions of fast multicharged ions in gas targets: charge transfer and ionization.** Schlachter, A.S. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Electron capture and ionization cross sections for multicharged ions colliding with H_2 and rare gases target are presented for projectile charge states range from 3^+ to 59^+ and energies from 0.1 to 4.8MeV/amu.

6404 Fluid Physics

REFER ALSO TO CITATION(S) 59936

60325 **(SAND—82-1682C) Consequences of a theory for flowing granular materials.** Passman, S.L. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-820843—1). NTIS, PC A02/MF A01. Order Number DE82019345.

From US-Japan seminar on new models and constitutive relations in the mechanics of granular materials; Ithaca, NY, USA (22 Aug 1982).

The fact that most geological materials are not simple materials leads to possible nonexistence of universal motions. Thus there are difficulties in interpreting the results of experiments. The difficulties are alleviated by detailed analysis of the boundary value problems associated with the experiments. This program is being carried out for flowing granular materials. Results obtained to date are discussed.

60326 (INIS-mf—7127, pp vp) **Chemical kinetics of reactions at high temperatures.** Fontijn, A. (Queen Mary Coll., London (UK). Dept. of Chemistry). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

60327 (INIS-mf—7127, pp vp) **High resolution spectroscopy of Lyman-α in microwave generated plasma.** Lifshitz, A. (Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

60328 (INIS-mf—7127, pp vp) **Chemical kinetics in thermal arc plasmas, influence of heating and quenching rates on the production of different molecules: NO, CO, Si.** Fauchais, P.; Baronnet, J.M.; Coudert, J.F.; Bourdin, E. (Limoges Univ., 87 (France)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

60329 (INIS-mf—7127, pp vp) **Some non-equilibrium trends and concepts in plasma chemistry.** Khait, Y.L. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Physics). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

60330 (INIS-mf—7127, pp vp) **Close-to-equilibrium plasma devices.** Goldfarb, V. (Avco-Everett Research Lab., Inc., Everett, MA (USA)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 60352, 60363, 60366, 60400

60331 **(DOE/ER/03065—T3) High energy physics. Progress report, 1981-1982.** (Duke Univ., Durham, NC (USA). Dept. of Physics). 1982. Contract AS05-76ER03065. 41p. NTIS, PC A03/MF A01. Order Number DE82019843.

Portions of document are illegible.

The research described includes: analysis of π neutral production from pion plus-proton interactions at 15.7 GeV/c; analysis of gamma-proton interactions at 19.5 GeV/c; recent data from 100 and 200 GeV/c π, p, and anti proton interactions with protons and nuclei; the experimental program at the Brookhaven multiparticle spectrometer; and equipment development. (GHT)

60332 (DOE/ER/03244—97) Experimental medium-energy physics. Annual progress report, July 1981-June 1982. (Carnegie-Mellon Univ., Pittsburgh, PA (USA)). 1982. Contract AC02-76ER03244. 85p. (COO—3244-97). NTIS, PC A05/MF A01. Order Number DE82020746.

Portions of document are illegible.

Research is summarized in hypernuclear and kaon scattering studies at the AGS, pion annihilation studies, and antiproton induced reaction studies. Hardware and software development are discussed. (GHT)

60333 (DOE/ER/04831—5) Weak decays and double beta decay. Annual progress report, January 1, 1982-December 31, 1982. Nicholson, H.W. (Mount Holyoke Coll., South Hadley, MA (USA)). Aug 1982. Contract AC02-78ER04831. 13p. (COO—4831-5). NTIS, PC A02/MF A01. Order Number DE82022008.

Portions of document are illegible.

Work has continued in collaboration with experimenters from Yale, Brookhaven and Pittsburgh (Brookhaven experiment 702) to measure asymmetries in the decays of polarized Σ^+'s into protons and neutral pions and of polarized Σ^-'s into neutrons and negative pions. A short experiment was carried out in the Brookhaven AGS A2 test beam to measure the efficiency of a cylindrical shower counter essential for measuring the asymmetry parameter in the rare decay of polarized Σ^+'s into protons and gammas. An electronic controller to stabilize the magnetic field of the superconducting, polarized target magnet was also designed and built at Mount Holyoke, and it functioned extremely well during a six week May to June run. Also, the design of an experiment to search for double beta decay in Molybdenum 100 is briefly described. A group consisting of five experimenters from LBL and two from Mount Holyoke hope to make a formal proposal in September to the LBL administration to begin work on this experiment late this year and during the next calendar year.

60334 (DOE/ER/40033—26) Neutral transverse energy spectra at $\sqrt{s}$ = 52 and 63 GeV. Angelis, A.L.S.; Basini, G.; Besch, H.J. (Rockefeller Univ., New York (USA); European Organization for Nuclear Research, Geneva (Switzerland); Oxford Univ. (UK)). 1982. Contract AC02-81ER40033. 8p. (CONF-820718—6). NTIS, PC A02/MF A01. Order Number DE82022003.

From 21. international conference on high energy physics; Paris, France (29 Jul 1982).

The cross section /dσ/dE/sub T/° (E/sub T/° = neutral transverse energy) was measured with an electromagnetic calorimeter covering 2 π in azimuth. The cross section follows an e⁻/sup αE/T distribution over 6 orders of magnitude with a slope parameter α = 0.86 GeV^{-1}. We present preliminary data for 9 GeV < E/sub T/° < 25 GeV.

60335 (DOE/ER/40048—10N2) Electroweak interactions. Henley, E.M. (Washington Univ., Seattle (USA). Dept. of Physics). Apr 1982. Contract AC06-81ER40048. 19p. (CONF-820475—2). NTIS, PC A02/MF A01. Order Number DE82020146.

From Conference on new horizons on electromagnetic physics; Charlottesville, VA, USA (21 Apr 1982).

It is attempted to show that electron scattering is a versatile tool to explore the weak interactions and test electroweak theories. Once a theory is well established these experiments serve to measure structure functions. For low energy electrons the PV asymmetry is sensitive to the weak force between nucleons; for intermediate energies it is reasonable to use electron scattering experiments to carry out detailed tests of the W-S or other electroweak theories. At very high energies, electron scattering occurs from almost free quarks and perturbative QCD can be applied. Finally, at intermediate high energies, it is likely that PV electron scattering experiments will serve as a powerful tool to investigate quark distribution functions and perhaps teach us more about quark confinement and its connection to the meson theory of nuclear forces.

60336 (DOE/ER/40051—435) Experimental and theoretical high-energy physics. Progress report, January 1, 1982-December 31, 1982. (Minnesota Univ., Minneapolis (USA). School of Physics and Astronomy). 1982. Contract AC02-82ER40051;AC02-76ER01764. 40p. (COO—1764-435; DOE/ER/01764—435). NTIS, PC A03/MF A01. Order Number DE82020959.

The research reported includes measurements with the Soudan 1 nucleon decay detector, polarization in hyperons, hyperon decay, hyperon magnetic moments, cosmic muons, and magnetic monopoles. (GHT)

60337 (FRNC-TH—1062) Production of dimuons of low mass at high transverse momentum: study of the rho, ω, phi resonances. Rahal, G. (Paris-11 Univ., 91 - Orsay (France). Div. de Physique Theorique). Jun 1981. 75p. (In French). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83780655.

Thesis.

The low mass of dimuons obtained in this experiment NA3, allowed to study the resonances rho, ω, phi of high transverse momentum (Psub(T) > 2GeV/c). This range has not been explored yet. The nuclear effects on the total cross section show a dependence proportionnal to Asup(α) where α is of the order of 1. It is possible to adjust an empirical function of the transverse momentum of the type 1/Psub(T).d$\sigma\Xi$/dPsub(T) α exp - bPsub(T). The coefficients b obtained are compatible with the resonances of lower transverse momentum. The distributions of positive rapidity seem to be maximum with great Y (Y > 1), but at low transverse momentum they are maximum at Y = 0. This changement could be a consequence of the break at Psub(T) = 2GeV/c of the events: at high transverse momentum most of the resonances are in the jet produced by fragmentation of a valence quark of the incident hadron.

60338 (ITF—82-37P) Interaction screening in the system electrically charged particles-dynamical membrane. Pilyavskii, A.I. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 37p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The screened interaction potential is obtained in the system electrically charged particles-dynamical membrane.

60339 (ITF—82-61E) Charged K[π]-meson decays with emission of the axial photon. Slad, L.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). May 1982. 10p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

An experiment aimed at verifying the hypothesis about the existence of the axial photon δ interacting with neutrinos is proposed. This interaction should lead to rare decays K[π] $\rightarrow \mu$ nu δ which can be separated on the basis of the energy balance. The energy spectrum of muons generated in these processes is calculated. Some aspects of a background simulation are discussed.

60340 (KEK—80-4, pp 76-87) Search for heavy lepton signature at TRISTAN. e^+-e^- colliding experiments. Suzuki, A. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Aug 1980. Dep. NTIS (US Sales Only).

From 4. TRISTAN workshop; Oho, Japan (1 May 1979).

The production of heavy leptons with mass between 10 and 20 GeV in the e^+e^--annihilation processes is discussed, and the contribution from the two-photon processes is also investigated. At the beam energy of 25 GeV, the production cross-sections of heavy leptons are not much different for the heavy lepton masses of less than 20 GeV. The momentum spectra of electrons and muons are shown in figures. The difference between V-A and V+A couplings affects the momentum distribution for three-body decays in the heavy lepton rest frame. There is some possibility to find the evidence of the heavy lepton signature by observing the shape and peak position of momentum spectra. It is easy to get the good resolution of cylindrical wire chambers in a solenoidal magnet for the study of heavy leptons. The two-photon processes grow to give sizable contribution to the production process, as the beam energy increases. It is important to install the perfect two-photon tagging system and the detection system for low momentum electrons and

muons in the central detector to eliminate multi-electron and -muon events.

60341 **(SLAC-PUB—2944) Some recent results from the MAC detector at PEP.** Ford, W.T. (Stanford Linear Accelerator Center, CA (USA)). May 1982. Contract AC03-76SF00515. 7p. (CONF-8205116—2). NTIS, PC A02/MF A01. Order Number DE82020739.

From 5. international conference on novel results in particle physics; Nashville, TN, USA (24 May 1982).

Preliminary results are presented for non-radiative and radiative muon pair production and limits on the production of excited muon states. A new measurement of the tau lepton lifetime is presented. Calorimeter studies of multihadron production are described, with preliminary results for the total and energy-correlation cross section and inclusive muon production rates.

60342 **(SLAC-PUB—2947) Bubble-chamber experiments on charmed-particle lifetimes.** Field, R.C. (Stanford Linear Accelerator Center, CA (USA)). Jul 1982. Contract AC03-76SF00515. 12p. (CONF-8205116—1). NTIS, PC A02/MF A01. Order Number DE82020470.

From 5. international conference on novel results in particle physics; Nashville, TN, USA (24 May 1982).

Portions of document are illegible.

The three current bubble-chamber experiments on charmed-particle lifetimes are compared. Their most recently released results are discussed.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 60359, 60364

60343 **(CNRS-CPT—81-P-1304) Particles with internal structure: the geometry of classical motions and conservation laws.** Duval, C.; Horvathy, P. (Centre National de la Recherche Scientifique, 13 - Marseille (France). Centre de Physique Theorique). Jun 1981. 23p. NTIS (US Sales Only), PC A02/MF A01.

Classical models of elementary particles endowed with internal structure are constructed using the coadjoint orbit method. The geometry of minimal coupling is introduced and the Wong equations are recovered. Conservation laws are derived in the case of symmetric external Einstein-Yang-Mills fields. As a non trivial example, classical motions in a Belyavin-Polyakov-Schwarz-Tyupkin instanton's field are investigated.

60344 **(DOE/ER/01545—323) Is the G(1440) a glueball.** Milton, K.A.; Palmer, W.F.; Pinsky, S.S. (Oklahoma State Univ., Stillwater (USA). Dept. of Physics; Ohio State Univ., Columbus (USA). Dept. of Physics). 1982. Contract AC02-76ER01545. 23p. (CONF-820718—5). NTIS, PC A02/MF A01. Order Number DE82021910.

From 21. international conference on high energy physics; Paris, France (29 Jul 1982).

The G(1440) qualitatively satisfies all criteria for a glueball: It is an isosinglet preferentially produced in hard gluon channels which mediate OZI inhibited processes in an SU(3) symmetric way. A simple pole model is used to predict G → $\delta\pi$, rhoγ, omega γ, phiγ, $\gamma\gamma$, rho$\pi\pi$, and eta$\pi\pi$. The small G → eta $\pi\pi$ rate is explained by a cancellation between G → $\delta\pi$ → eta$\pi\pi$ and G → etaϵ → eta$\pi\pi$ amplitudes which has also been observed in the corresponding s(1275) amplitude. While the G does not fit naturally into a pure radial excitation nonet - one cannot account for the mass spectrum - standard octet-singlet mixing with angle Θ/sub R/ = -18° yields rates for psi → γG and psi → γs(1275) production that are not now inconsistent with the limit on G production in π^-p → Gn. 41 references.

60345 **(DOE/ER/01545—324) Realistic quark masses and mixing angles without scalars.** Aubrecht, G.J. II; Matsuki, T.; Tanaka, K. (Ohio State Univ., Columbus (USA). Dept. of Physics). 1981. Contract AC02-76ER01545. 8p. NTIS, PC A02/MF A01. Order Number DE82020750.

A model in which the three family quark mass matrices M/sup U/ and M/sup D/ is related to the extended technicolor vector boson mass matrix is presented. A phenomenological mass matrix is consistent with the model when the u-quark mass is about 50 MeV.

60346 (INIS-mf—6968, pp 152-164) **Collective phenomena in hypernuclei.** Zofka, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czechoslovakia)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Lambda binding energies, changes of nucleon radii and quadrupole deformations are studied using a central Gaussian Λ-N interaction with varying ranges and Majorana exchange component. A dependence of these parameters on the Majorana component and their insensitivity to the ranges are pointed out.

60347 **(JINR—E-4-81-677) Description of the nucleon, Λ particle interaction with the lightest nuclei at low energies.** Belyaev, V.B.; Pupyshev, V.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702623.

The proposed earlier three- and four-particle equations are used to describe the low-energy scattering in the systems Λd, Λ^3H, Λ^3He, Nd, N^3H, N^3He and to find the binding energies of the lightest hypernuclei. The calculations of scattering lengths of neutrons and lambda particles on D, ^{3}H and ^{3}He nuclei are given.

60348 **(KEK—80-14) Proceedings of the workshop on high energy nuclear studies at KEK.** Nakai, K.; Masaike, A. (eds.). (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Feb 1981. 126p. (In Japanese). (CONF-8012103—). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780635.

From Workshop on high energy nuclear studies at KEK; Oho, Ibaraki, Japan (16 Dec 1980).

Separate abstracts were prepared for papers from this workshop on high energy nuclear studies held at a Japanese facility (KAW)

60349 (KFTI—80-6, pp 60-61) **D-116 computer on-line measurement system for study on photoproduction and photon elastic scattering by hadrons.** Baranov, P.S.; Vol'nov, M.I.; Eliseev, A.N.; Zhuravlev, E.E.; Nafikov, A.A.; Osadchii, A.I.; Smirnov, P.A.; Raevskii, V.G.; Cherepnya, S.N.; Yanulis, Yu.P. (AN SSSR, Moscow. Fizicheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From Hadron electromagnetic interactions in the resonance energy range; Kharkov, Ukrainian SSR (30 May 1979).

A measuring system is described for studying the processes of pion photoproduction and elastic scattering of photons by hadrons in the average-energy range, operating on line with the D-116 computer. A flowsheet of the system and organization scheme of data flows are given. Provision is made for calibrating photomultipliers of the detectors employed in the system. The software makes it possible to perform the routine histogramming of spectra, constructing of mass spectra and energy distributions of neutrons, protons and pions for a certain predetermined reaction code. The measuring system permits the simultaneous investigations on several reaction types to be carried on.

60350 (TRI—79-1, pp 59-66) **Mechanism of baryonium and dibaryon.** Nakamura, H. (Aoyama Gakuin Univ., Tokyo (Japan). Coll. of Science and Engineering). Dec 1979. Dep. NTIS (US Sales Only).

From Kaon factory workshop; Vancouver, Canada (13 Aug 1979).

The spectra of baryonium (q^3anti q^3) and dibaryon (q^6) are analyzed on the basis of the quark shell model (q = d or u). The general mass formula for the excited states of the quark systems which consist of various kinds of quarks is derived and applied to the analyses of the spectra of mesons (s anti s), (s anti q), (c anti c) and (b anti b).

6453 Particle Invariance Principles And Symmetries

60351 (INIS-mf—7080) Conformally invariant theory of exclusive elementary particle scattering at large angles. Jacob, P. (Max-Planck-Institut zur Erforschung der Lebensbedingungen der Wissenschaftlich-Technischen Welt, Starnberg (Germany, F.R.); Technische Univ. Muenchen, Garching (Germany, F.R.). Fakultaet Physik). 25 Jul 1979. 110p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780652.

Thesis.

This thesis derives implications of a conformal invariance of exclusive high energy scattering of massive particles at large angles. The unpolarzied scattering cross section possesses the scaling behaviour dsigma/dt approx. equal to ssup(2-Σtausub(i)).The tiwst tau, is the difference of the dimension and the maximal spin of the irreducible representaion attributed to the i-th entrance (exit) channel. Polarization effects are dicussed. The comparison with the experiment attributes to the pions the representation D(2; O,O) and to the nucleons the representations D(7/2; 1/2, O) and D(7/2; O, 1/2). This implicates for parton models the existence of spin-O and spin-1/2 partons. Para-Bose operators with four degrees of freedom of order 2 generate the pion representation, and such of order 3 generate the nucleon representations.

60352 (TRI-PP—82-19) Experimental test of charge symmetry in n-p elastic scattering. Birchall, J.; Davison, N.E.; Gubler, H.P. (Manitoba Univ., Winnipeg (Canada). Dept. of Physics). Jun 1982. 13p. (CONF-820941—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82906210.

From 5. international symposium on high energy spin physics; Brookhaven, NY, USA (16 Sep 1982).

Portions of document are illegible.

An experiment is described to investigate the isospin-mixing, charge-symmetry breaking component in the n-p interaction. The experiment measures the difference ΔA between the neutron and proton analyzing powers A/sub n/ and A/sub p/ in n-p elastic scattering at 500 MeV. The experiment consists of two interleaved phases in which polarized neutrons, respectively unpolarised neutrons are scattered from an unpolarised, respectively polarised proton target of the frozen spin type. Designed as a null-measurement requiring no accurately known polarisation standards, the experiment determines the difference in angle at which A/sub n/ and A/sub p/ cross through zero. It is intended to provide an unambiguous test of a class IV charge-symmetry breaking effect to the level of $\Delta A \cong 0.001$, corresponding to a laboratory angle difference at zero crossing of approx. 0.05°.

6454 Field Theory

REFER ALSO TO CITATION(S) 60344

60353 (ITF—82-32E) Effective Hamiltonian of rotational excitations in the Elliott SU(3)-scheme with real interaction. Filippov, G.F.; Avramenko, V.I. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 28p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

It is shown that study of the spectrum of rotational excitations within the Elliott SU(3)-scheme with a real nucleon-nucleon potential can be reduced to the problem of diagonalization of an effective Hamiltonian representing an operator polynomial of generators in a group of three-dimensional rotations. The form of this polynomial depends on the indices of SU(3)-symmetry, and its coefficients are expressed through the nucleon-nucleon potential parameters. The first terms of this polynomial, quadratic in generators, coincide with the Hamiltonian of a rigid non-axial rotator.

60354 (ITF—82-45P) Infinitesimal operators of representations of the groups SO(n,C) and SO(n) x SO(n) in a SO(n) basis. Kachurik, I.I.; Klimyk, A.U. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 24p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

Infinitesimal operators of the representations of the most degenerate series of the group SO(n,C) and of the unitary representations of the group SO(n) x SO(n) with the highest weights (M_1, O,...,O) (M_2, O,..,O) in a SO(n) basis where (SO(n) is diagonally embedded into SO(n) x SO(n)) are derived. Recursive relations are obtained for Clebsch-Gordan coefficients of the tensor product (M_1, O,...O) (M_2, O,...) of the representations of SO(n), which relate different resulting representations.

60355 (ITF—82-48E) Dynamical realization of linear δ-model in quantum chromodynamics. Gusynin, V.P.; Miranskii, V.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 19p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The recently suggested mechanism of the spontaneous breakdown of the chiral symmetry in quantum chromodynamics (QCD) is applied to investigate the spectrum of scalar mesons. It is shown that the mechanism leads to the dynamical realization of the linear δ-model in QCD.

60356 (ITF—82-52P) Dynamical symmetry breakdown and the criterion of maximally attracting channel in gauge theories. Gusynin, V.P.; Miranskii, V.A.; Sitenko, Yu.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 48p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The mechanism of the dynamical symmetry breakdown in gauge theories without fundamental scalar fields is considered. The criterion of maximally attractive channel is realized dynamically. The proposed method allows one to find the residual symmetry of the stable vacuum also in those cases when the criterion does not yield definite results.

60357 (NP—2906159) Ultimate structure of matter. Weinberg, S. (Harvard Univ., Cambridge, MA (USA)). 1981. 25p. (CONF-8110222—1). Harvard University, Cambridge, MA.

From Symposium and banquet speeches of the celebration of the 50th anniversary of Lawrence Berkeley Laboratory; Berkeley, CA, USA (3 Oct 1981).

The development of quantum field theories and their testing are reviewed. (GHT)

60358 (RLO—1388-873) Grand unification and gravity - selected topics. Zee, A. (Washington Univ., Seattle (USA)). Sep 1981. Contract AC06-76ER01388. 91p. (CONF-8106228—2). NTIS, PC A05/MF A01. Order Number DE82020191.

From Conference on grand unified theories and related topics; Kyoto, Japan (29 Jun 1981).

Portions of document are illegible.

The material given here was presented in lectures delivered at the 4th Kyoto Summer Institute on Grand Unification and Related Topics. It consists of six sections. The sections are: the family problem, fermion mass hierarchy, maximal local symmetry, operator analysis of new physics, dynamically generated gravity, and Kaluza theory and grand unification. The last section contains a (hopefully) pedagogical introduction to Kaluza theory. For pedagogical completeness, several appendices reviewing some elementary notions of differential geometry have been added.

60359 (RLO—01388-871) Non-perturbative approach to the long-distance behavior of Yang-Mills theory and the problem of quark confinement in QCD. Baker, M. (Washington Univ., Seattle (USA). Dept. of Physics). Sep 1981. Contract AC06-76ER01388. 51p. (CONF-8106191—1). NTIS, PC A04/MF A01. Order Number DE82020192.

From NATO AST conference on quantum electrodynamics of strong fields; Lahnstein, F.R. Germany (15 Jun 1981).

Portions of document are illegible.

It is shown that the zero field static color dielectric constant ϵ(q vector) vanishes like q vector^2 as q vector^2 approaches zero. This is a consequence of self-consistency in the presence of anti-screening imposed by the Schwinger-Dyson equation and Slavnov-Taylor identities for ϵ. This color dielectric constant when inserted into Maxwell's equations, yields an infinite long distance self-energy

for a single colored source, and gives rise to an energy for two colored sources of opposite charge, which increases linearly with their distance of separation.

6455 Scattering Theory

60360 (ITF—82-51E) States with positive energy which result from the Hamiltonian diagonalization on the oscillator basis. Filippov, G.F.; Chopovskii, L.L.; Vasilevskii, V.S. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 24p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The states of continuous spectrum in a system of two interacting clusters are studied. It is shown that the Hamiltonian diagonalization on the oscillator basis isolates those states in a continuous spectrum whose amplitudes have a node at a certain number of oscillator quanta.

65 PHYSICS RESEARCH

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 59635

60361 (INIS-mf—7123) Proceedings of the miniconference on the study of few body systems with electromagnetic probes. (Nationaal Inst. voor Kernfysica en Hoge-Energiefysica (NIKHEF), Amsterdam (Netherlands)). 1981. 187p. (CONF-8111103—). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82780627.

From Conference on the study of few body systems with electromagnetic probes; Amsterdam, Netherlands (19 Nov 1981).

The papers presented are entered in the data base separately. (WHK)

60362 (RL—81-080) Use of the spallation neutron source for heavy ion fusion beam dynamics studies. Proceedings of a workshop held in Abingdon, 23-26 March 1981. King, N.M. (ed.). (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Mar 1981. 104p. (CONF-810375—). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780637.

From Workshop on the application of the SNS to heavy ion fusion; Abingdon, UK (23 Mar 1981).

Abstracts of individual items from the workshop were prepared separately for the data base. (GHT)

6512 Nuclear Properties And Reactions, A=1-5

REFER ALSO TO CITATION(S) 60011, 60012

60363 (ITEF—72(1981)) Estimation of the neutrino rest mass from measurements of the tritium β-spectrum. Lyubimov, V.A.; Novikov, E.G.; Nozik, V.Z.; Tret'yakov, E.F.; Kozik, V.S.; Myasoedov, N.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1981. 56p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82702416.

The problems connected with performing tritium β spectrum measurements close to the boundary point with the purpose to specify data on rest mass of antineutrino are discussed. The improved experimental installation created on the base of iron-free toroidal β spectrometer with four-fold electron deviation is described. As β electron detectors the threechannel proportional chamber filled with argon with methyl alcohol addition is used. The total chamber length is 40 mm. The detector efficiency constitutes approximately 50%, the background is reduced to 0.05 c^{-1}. The application of the three-channel detector enables to increase the data acquisition rate 2.5 times ass compared with experiments in which ordinary proportional counters are used. To increase the accuracy of energy measurement the electron source unit has been improved. In the present experiment two nonequipotential sources have been placed: main source of tritium β particle and calibration source. The processing of measurement results is considered in detail. When determining confidence level for antineu trino rest mass the method of mathematical modelling is applied. For the rest mass anti νsub(e) the lower limit has been obtained for the first time, 14<=msub(anti μ(sub(e))<=eV. For tritium β decay energy the value E_0=18577+-13 eV has been found.

60364 (ITEP—135(1981)) Elastic backward πd scattering at medium energies in relativistic model. Kondratyuk, L.A.; Lev, F.M.; Shevchenko, L.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1981. 36p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702620.

The elastic π-d scattering at large angles in the energy region 0.4-1.5 GeV is investigated. The single and double scattering terms for the scattering amplitude are analyzed in the framework of relativistic three-body equations. The pseudoresonance contribution of the eta meson production near threshold is also taken into account. The energy dependence of $d\sigma/d\Omega$ (180 deg) cross section the angular distributions for different energies are calculated. The structures in the energy dependence of $d\sigma/d\Omega$ (180 deg) at 0.4-0.6 GeV/c 1.2-1.5 GeV/c are treated as contributions of dibaryon resonances with masses 2.26, 2.43 and 2.9-3.0 GeV.

60365 (ITF—82-53P) Nucleon polarization in d(e,e'p)n reaction. Malyarzh, E.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 18p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

Proton polarization in d(e,e'p)n reaction is calculated for the case of backward electron scattering (electron scattering angle is equal to π). The degree of polarization is shown to depend essentially on the choice of both deuteron ground state radial wave functions and wave functions describing proton-neutron interaction in continuum.

60366 (JINR—E-1-81-288) Coherent proton diffraction dissociation on helium from 46 to 400 GeV. Bujak, A.; Devensky, P.; Jenkins, E. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 28p. NTIS (US Sales Only), PC A03/MF A01.

Inclusive coherent proton diffraction dissociation on helium has been measured at the Fermilab accelerated incident proton momenta 46<P_0<400 GeV/c and at momentum transfers t and missing masses Msub(x) covering the ranges u 04<'t'<0.40 (GeV/c^2) and (Msub(p)+Msub(π))sup(2)<Msub(x)sup(2)<10 GeV^2. The characteristic fatures of the mass distributions are a large en/e/hancement at Msub(x)sup(2) approximately equal to 2 GeV^2 and a high mass tail decreasing approximately as 1/Msub(x)sup(2). At small t values the differential cross sections σ are sharply decreasing functions of 't' with the slope parameter reflecting the helium form factor and the slope of elementary proton diffraction dissociation. At large t values the t dependence of σ is governed by multiple scattering processes yielding small values of slope. Within the framework of a simplified Glauber model the cross sections are found to be very sensitive to the details of the amplitude of the proton diffraction dissociation and to the total cross sections of the diffractively produced states.

60367 (JINR—E-2-81-583) Relations between polarization parameters in the process N+N reversible d+π. Kopeliovich, B.Z.; Lapidus, L.I.; Vegh, L. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702621.

Relations connecting the parameters, describing polarization of deuterons in NN→dπ process, and the Asub(nn), A_1, A_2 cross section parameters are established. At THETA=π/2, the $(T_{22})_{00}$, $(T_{21})_{00}$, and $(T_{20})_{00}$ quantities are given by parameter Asub(nn). The connection between the exact relations and different theoretical approximations is disciussed. The proof of the Wilkin relation for the Asub(uv) components at THETAsub(π)=0, π/2, π is given in the Appendix.

60368 **(JINR-R—4-81-672) Lengths and volumes of pion scattering on nuclei.** Belyaev, V.B.; Rakhimov, A.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702625.

Basing on equations of the strong coupling-channel method reformulated with the help of the Schwinger variational principle, the real parts of s- and p-wave scattervg lengths, asup(s) and asup(p), of pions on spherical nuclei ^{4}He, ^{12}C, ^{28}Si, ^{32}S, ^{16}O, and ^{40}Ca are calculated. It is shown that asup(s) and especially asup(p) are little sensitive to the structure of the nucleus ground state, which allows to establish a certain limit for the range of the p-wave πN-potential.

60369 (KFTI—80-6, pp 26-27) **Calculations of partial cross sections for π^0-meson photoproduction on light nuclei.** Tryasuchev, V.A.; Lebedev, A.I.; Fetisov, V.N. (AN SSSR, Moscow. Fizicheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From Hadron electromagnetic interactions in the resonance energy range; Kharkov, Ukrainian SSR (30 May 1979).

Within the framework of the impulse approximation and the shell model with intermediate coupling the differential cross sections of the γ^6Li $\rightarrow \pi^{06}$Li*(epsilon), γ^6Li $\rightarrow \pi^{06}$Li*(epsilon) $\rightarrow \pi^0\gamma'^6$Li, γ^4He $\rightarrow \pi^{04}$He partial reactions at the energies of the ^{6}Li nucleus excitation epsilon=0, 2.18, 3.56, 4.27 and 5.37 MeV are calculated. In calculations the dependence of a single-nucleon photoproduction operator from the nucleon momentum in a nucleus was taken account of. It has been shown that in the energy range of incident photons, corresponding to excitation of the first and second nucleon resonances, the cross sections of the reactions with variation of the isospin are suppressed. A comparison of the calculated cross sections for a ^{4}He nucleus with the experimental data shows that it is necessary to take account of the pion interaction with a nucleus in the final state.

6513 Nuclear Properties And Reactions, A=6-19

REFER ALSO TO CITATION(S) 60368, 60369

60370 (INIS-mf—6968, pp 167-171) **Sp(2,R)-model as the description of large amplitude collective motion.** Arickx, F.; Broeckhove, J. (Rijksuniversitair Centrum te Antwerpen (Belgium)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The spectrum of the ^{8}Be nucleus is calculated within a complete irrep of Sp(2,R) using a Volkov-type two-body interaction and the Generator Coordinate Method (GCM). The numerical results for ^{8}Be were compared to experimental levels obtained from α-scattering experiments.

60371 (INIS-mf—7058, pp 716-733) **Resonances above the coulomb barrier in light heavy ion systems.** Paul, P. (New York Univ., NY (USA). Dept. of Physics). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Recent experimental results obtained with the ^{12}C+^{16}O system at c.m. energies between 19.7 and 47 MeV are discussed. New resonance spin determinations for intermediate resonances seen strongly in inelastic channels are presented. These spins, obtained from particle-γ correlations differ from values previously inferred from elastic scattering and are in several cases two units lower than the maximal optical model standing wave. Secondly, an excitation function is shown obtained in the badly mismatched channel to the excited O^+ state in ^{16}O. The excitation function displays narrow resonances at c.m. energies as high as 34 MeV. The implications of these data on current models for heavy ion resonances in light heavy ion systems are briefly discussed.

60372 (INIS-mf—7079) **Study of excited states of the nucleus ^{12}C in the range of overlapping resonances using the proton scattering on ^{11}B and the nuclear reaction ^{11}B(p,α_0)^{8}B e in the energy range Ep = 4.5 ... 7.5 MeV.** Boerchers, F. (Bochum Univ. (Germany, F.R.). Abt. Physik und Astronomie). 1979. 163p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780661.

Thesis.

Using a partial wave analysis the angular distributions measured for the reactions ^{11}B (p,p') ^{11}B* and ^{11}B (p,a) ^{8}Be in the energy range from 4.5 to 7.5 MeV the resonance states of ^{12}C were determined including level widths, spin, parity, and isopin.

60373 (INIS-mf—7116, pp vp) **Study of the ^{6}Li(n,^{4}He)^{3}H reaction between 2 and 18 MeV.** Bartle, C.M. (Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Inst. of Nuclear Sciences). 1982. Dep. NTIS (US Sales Only).

From 9. AINSE nuclear physics conference; Melbourne, Australia (8 Feb 1982).

60374 **(ITF—80-127E) Study of collective excitation properties of nuclei ^{18}O and ^{18}Ne in generalized hyperspherical function method.** Ovcharenko, V.I.; Okhrimenko, I.P.; Steshenko, A.I. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Dec 1980. 40p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

A complete basis of functions of longitudinal vibrations of inertia ellipsoid is used to investigate the energy spectrum of collective excitations as well as certain characteristics of the considered levels in mirror nuclei ^{18}O and ^{18}Ne.

60375 **(JINR—E-7-81-653) Is there a giant monopole resonance in ^{12}C.** Dymarz, R.; Shitikova, K.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702624.

Arguments that the 0^+ (Esub(x)=20.3 MeV) state recently found in ^{12}C can be interpreted as a giant resonance are given. The calculations of differential cross sections of the 0^+ state excitation in elastic and inelastic scattering of ^{3}He, ^{4}He and ^{6}Li on ^{12}C and compared with experimental data. Using transition densities calculated in the hyperspherical function method it is shown that in the framework of the collective model this single state exhausts the monopole energy weighted sum rules.

60376 (KFTI—78-46, pp 50-51) **Effect of high-energy electron emission spectrum in monocrystal on photoneutron yield.** Shramenko, B.I.; Grishaev, I.A.; Vit'ko, V.I. 1978. (In Russian). Dep. NTIS (US Sales Only).

In Technique of physical experiment.

The photoneutron yield from Be and C amorphous targets under the effect of coherent γ-radiation, due to the 1 GeV electrons when passing through Si monocrystal, is measured. The electron beam with the divergence of $2x10^4$ rad and the energy scattering $\Delta E/E <= 1$ % is directed to a crystal 300 μm thick. γ-quanta emitting from the crystal in the angular span of $5x10^{-3}$ rad through a channel in the shield are transported to the target placed 12 m from the crystal to decrease the effect of the accelerator neutron background. Crystal orientation is carried out by measuring the intensity of crystal bremsstrahlung using an ionization chamber. Electron beam current monitoring is performed using an ionization chamber. Photoneutrons which generated from the target are registered by an "all-wave" BF_3- counter. The investigation has shown that the neutron maximum yield Nsub(max) is observed in the case when the angle of disorientation of the crystal axis relatively to the electron beam direction is PHI=0. This is conditioned by the electron coherent radiation. The minimum neutron yield Nsub(min) is PHI approximately 150 mrad when due to electrons bremsstrahlung in a monocrystal takes place. The increase of neutron yield determined as the ratio Nsub(max)/Nsub(min) is 3.3 for a carbon target and 4.3 for a beryllium target. The conclusion is made that photoneutron yield in the cases studied depends on monocrystal orientation and threshold of (γ, n)- reaction.

60377 **(LA-UR—82-2540) Annihilation of low-energy antiprotons in nuclei.** DeVries, R.M.; DiGiacomo, N.J. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 19p. (CONF-8205103—3). NTIS (US Sales Only). Order Number DE82022016.

From Workshop on physics at LEAR with low energy cooled antiprotons; Erice, Italy (9 May 1982).

Portions of document are illegible.

We discuss the effect of antiproton annihilation within nuclei from the perspective of realistic intranuclear cascade calculations (INC). The results indicate a significant energy deposition for a class of annihilations that are shown to occur relatively deep within the nucleus. In addition, promising experimental observables and triggers are identified. The calculations are especially relevant to LEAR antiproton-nucleus experiments, particularly PS 187. This experiment is described here and possible future investigations are suggested.

60378 **(LA-UR—82-2541) Experimental determination of the effective nucleon-nucleon interaction for p-nucleus reactions at intermediate energies.** McClelland, J.B.; Aas, B.; Azizi, A. (Los Alamos National Lab., NM (USA); California Univ., Los Angeles (USA); Rutgers--the State Univ., New Brunswick, NJ (USA). Dept. of Physics; Minnesota Univ., Minneapolis (USA). Dept. of Physics). 1982. Contract W-7405-ENG-36. 9p. (CONF-820828—5). NTIS, PC A02/MF A01. Order Number DE82022015.

From International conference on nuclear structure; Amsterdam, Netherlands (29 Aug 1982).

A complete measurement of the polarization transfer observables has been made for the first time in the (p,p') reaction at intermediate energies. Measurements are reported for the $^{12}C(p,p')$ ^{12}C reaction to the 1^+, T = 0(12.71 MeV) and 1^+, T = 1(15.11 MeV) states at 500 MeV at laboratory scattering angles of 3.5°, 5.5°, 7.5°, and 12.0°. Linear combinations of these observables are shown to exhibit a very selective dependence on the isoscalar and isovector spin-dependent components of the nucleon-nucleon interaction. To the extent of the validity of the single collision approximation, these amplitudes are compared directly to the free nucleon-nucleon amplitudes at small momentum transfers (< 1 fm^{-1}).

60379 **(LBL—14677) (p,2p) study of high-momentum components at 2.1 GeV.** Treuhaft, R.N. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 135p. NTIS, PC A07/MF A01. Order Number DE82020309.

Thesis.

A (p,2p) experiment designed to isolate interactions with small numbers of fast nuclear constituents is described. Special attention is paid to the experimental manifestation and description of a correlated pair of nucleons in the nucleus. Phase space calculations are presented for the proton-pair three-body final state and for final states with larger number of particles. The Two Armed Spectrometer System (TASS) is described in detail. The data suggest the possibility of isolating an interaction with one or two nucleons in the nucleus which may have momenta far in excess of those described in a Fermi gas model.

60380 **Contribution of pion absorption with two-nucleon emission to the pion-nucleus optical potential.** Garcilazo, H. (Texas A and M Univ., College Station (USA). Dept. of Physics); Gibbs, W.R. (Los Alamos National Lab., NM (USA). Theoretical Div.). *Nuclear Physics [Section] A;* **381**: No. 3, 487-506(21 Jun 1982).

Four terms in the pion-nucleus optical potential which arise from pion absorption with two nucleon emission are calculated using a model in which the nucleon is treated as a bound state of a pion and a nucleon. The contribution of these terms to the reaction cross section of carbon is considered. Two of the terms give rise to a negative reaction cross section, but it is shown that the sum of the four is positive definite. We find that the absorption reaction cross sections are very sensitive to the off-shell behavior of the free pion-nucleon T-matrix.

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 60368

60381 **(DOE/ER/02853—16) Nuclear-structure studies by the scattering of medium-energy electrons. Progress report, October 1, 1980-July 31, 1981.** Peterson, G.A. (Massachusetts Univ., Amherst (USA)). Aug 1981. Contract AC02-76ER02853. 33p. NTIS, PC A03/MF A01. Order Number DE82019270.

Electron scattering experiments are in progress at the Bates Linear Accelerator in Middleton, Massachusetts. Both magnetic elastic and transverse inelastic scattering cross sections have been measured at 180° by the apparatus constructed and brought into operation in late 1977 by the University of Massachusetts. A liquid-nitrogen-cooled gas target is being used in a study of deuteron elastic scattering and electrodisintegration over a large energy range. A measurement of elastic magnetic and transverse inelastic scattering from ^{14}N has been started. Measurements of the elastic magnetic scattering from ^{13}C, ^{15}N, ^{27}Al, ^{29}Si, and ^{31}P have been completed. The data set on ^{15}N inelastic scattering are now complete and analysis of the data is in progress. A study of M8 transitions in ^{54}Fe and ^{60}Ni is nearing completion. A measurement of the transverse quasielastic scattering from ^{56}Fe has been started. Planning for an experiment utilizing radioactive ^{14}C is underway. Large-basis shell model calculations pertaining to the above nuclei and others have been made. Theoretical calculations of exchange currents, nuclear convection currents, and other nuclear phenomena are in progress. Finally, considerations are being given to the design of an integrated storage-ring-experimental system.

60382 (INIS-mf—7058, pp 468-481) **Energy dissipation and mass diffusion in $^{40}Ar+^{27}Al$ and $^{14}N+^{27}Al$ heavy-ion reactions.** Billerey, R.; Cerruti, C.; Chevarier, A.; Chevarier, N.; Cheynis, B.; Demeyer, A. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Zohni, O. (Iowa State Univ. of Science and Technology, Ames (USA)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Energy dissipation phenomena are analyzed in Ar+Al (Esub(lab)=340 MeV) and N+Al (Esub(lab)=100 MeV) by studying their correlation with the variance of the charge distributions as function of total kinetic energy loss bins. Considerable energy damping is found to occur in the approach phase which can not be explained by a simple Fokker-Planck diffusion model.

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 60368, 60426

60383 (INIS-mf—7058, pp 673-675) **Deep inelastic collisions and fusion of ^{20}Ne with ^{40}Ca at 151 MeV.** Merchez, F.; Darves-Blanc, R.; Gondrand, J.C.; Nguyen Van Sen (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Fusion and elastic scattering angular distributions were measured with natural Ca target, 100 $\mu g/cm^2$ thick, and bombarded by $^{20}Ne(6^+)$ beams at 151 MeV from the Grenoble isochronous cyclotron. The evaporation residues from the compound nucleus were detected by a gas-flow ionization chamber (ΔE) containing a surface-barrier Si detector (E) on the rear side. The evaporation products belong to a peak in the E vs. ΔE plane with a ridge running toward $\Delta E=E=0$. The fusion angular distributions were measured by comparison with the elastic events and a monitor detector placed at a fixed angle. The elastic angular distributions were simultaneously measured on the opposite side of the beam direction by means of three Si detectors.

60384 **(ITF—82-22E) Microscopic calculations of spectrum of collective excitations in ^{44}Ti.** Okhrimenko, I.P.; Steshenko, A.I. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Feb 1982. 24p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

Using the generalized hyperspherical function method the structure of yrast states in ^{44}Ti and the levels of monopole and quadrupole giant resonances are constructed. Besides, the energy spectrum, geometric and electromagnetic characteristics of the collective excitations are defined. Different sum rules for the states of giant resonance are calculated.

60385 **(JINR-R—1-81-590) Search for isomers of density on multiple emission of delayed neutrons at irradiation of Fe, Sn and Pb by relativistic ^{4}He and ^{12}C nuclei.** Avdeev, S.P.; Vasil'kov, R.G.; Karnaukhov, V.A.; Kuznetsov, V.D.; Myzin, N.S.; Petrov, L.A.; Starostin, V.B.; Chirkin, Yu.M. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1981. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702632.

Delayed neutron emission was investigated for the Fe, Sn, Pb targets irradiated by the n44 GeV carbo beam and for Sn and Pb targets irradiated by the ^{4}He beam at the 5.04 GeV energy. Multiple emission of delayed neutrons by the high energy isomers (density isomers, for example) is searched for. A neutron detector with 17 ^{3}He-proportional counters was used. The events of one, two, three neutron emission were measured simultaneously. The delayed three neutron emission in the half-life range of 1 $s<r<=10^{2}$ s has not been observed. The corresponding upper limits for the cross sections have been calculated to be equal to $6.8x10^{-30}$ cm^{2} (for Sn+^{4}He); $3.4x10^{-29}$ cm^{2} (for Pb+^{4}He); $4.5x10^{-30}$ cm^{2} (for Fe+^{12}C); $2.7x10^{-29}$ cm^{2} (for Sn+^{12}C); $1.1x10^{-28}$ cm^{2} (for Pb+^{12}C).

6516 Nuclear Properties And Reactions, A=59-89

60386 (INIS-mf—6968, pp 304-312) **Quasiparticle phonon coupling in ^{89}Y(p,p').** Reif, R.; Weissbach, B. (Technische Univ., Dresden (German Democratic Republic)); Stoyanov, Ch.; Vdovin, A.I. (Joint Inst. for Nuclear Research, Dubna (USSR)); Betak, E. (Slovenska Akademia Vied, Bratislava (Czechoslovakia). Fyzikalny Ustav). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The semimicroscopic treatment of odd-even spherical nuclei that does not apply the weak coupling assumption about the quasiparticle phonon coupling was used to the ^{89}Y(p,p') reactions. The differential cross sections for the isolated levels were calculated within the DWBA and CCBA. Both positive and negative parity states of half integer isospin up to 5 MeV excitation energy were analyzed.

6517 Nuclear Properties And Reactions, A=90-149

REFER ALSO TO CITATION(S) 60385, 60417, 60422, 60425

60387 (INIS-mf—6819, pp 79) **Lifetimes and the structure of excited states in ^{108}Cd.** Gusinskij, G.M.; Zvonov, V.S.; Lemberg, I.Kh. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60388 (INIS-mf—6819, pp 89) **Study of gamma radiation following thermal neutron capture by ^{113}In and ^{115}In.** Alekseev, V.L.; Barro, Zh.; Berner, Kh.; Dehvidson, U.; Rumyantsev, V.L. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60389 (INIS-mf—6819, pp 98-99) **Study on the decay of ^{147}Eu oriented nuclei.** Deryuga, V.A.; Kratsikova, T.I.; Finger, M.; Fominykh, M.I.; Tsupko-Sitnikov, V.M.; Yushkevich, Yu.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60390 (INIS-mf—6819, pp 100) **Intensity ratio of α-decays of ^{148}Sm compound states into the 0^{+}, 2^{+} and 4^{+} states of ^{144}Nd.** Andzheevski, Yu.; Bechvarzh, F.; Vo Kim Tkhan'; Vtyurin, V.A.; Popov, Yu.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60391 (INIS-mf—6819, pp 104) **Decay of sup(148-151)Ho short-living isotopes.** Ganbaatar, N.; Kormitski, Ya.; Mezilev, K.A.; Novikov, Yu.N.; Polyakov, A.G.; Potempa, A.; Tarasov, V.K.; Tarkani, F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60392 (INIS-mf—6819, pp 652) **Resonance scattering of neutron-capture gamma radiation on ^{90}Zr.** Begzhanov, R.B.; Akhrarov, S.M.; Kebiliv, O.Sh.; Kulabdulaev, G.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60393 (INIS-mf—6968, pp 9-20) **Excitation of giant nuclear resonances by the electrons, protons and heavy ions.** Afansiev, G.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The nuclear charge transition densities of the giant E1 and E2 resonances in ^{90}Zr are calculated in the framework of the semimicroscopic model. It is shown that the calculated excitation formfactors agree well with the experimental data.

60394 (INIS-mf—6968, pp 34-57) **Search for isovector giant resonances in charge-exchange reactions.** Galonsky, A. (Michigan State Univ., East Lansing (USA). Cyclotron Lab.). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Various charge exchange reactions [(p,n), (n,p), (^{3}He,t) and (^{6}Li,^{6}He)] in different experiments - with special emphasis on Zr experiment - are analyzed in order to learn if they confirm the existence of giant Gamow-Teller (spin-flip) transition.

60395 (INIS-mf—6968, pp 92-98) **Deuteron excitation of the isoscalar breathing mode resonance in ^{90}Zr, ^{120}Sn and ^{208}Pb.** Marty, N.; Willis, A.; Morlet, M.; Frascaria, R.; Comparat, V. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Kitching, P. (Alberta Univ., Edmonton (Canada)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The experimental set-up using 108 MeV deuteron beam to investigate the breathing mode is described briefly. The energies and widths of the monopole isoscalar resonances are determined and compared to the results of other experiments.

60396 **(INIS-mf—7054) Nuclear spectroscopic studies on the nucleus ^{107}Cd using an apparature for the measurement of neutron-gamma angular correlations.** Kreyling, G. (Frankfurt Univ. (Germany, F.R.). Fachbereich Physik). 13 Feb 1980. 141p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780658.

Thesis.

In the present thesis an apperature for the measurement of n-γ angular correlations was developed. With that the nucleus ^{107}Cd was studied using the reaction ^{107}Ag(p,nγ) ^{107}Cd. The analysis of the measured angular distributions yields by comparison with the calculated angular distribution a number of hitherto not yet or only uncertainly determined spins. Especially for levels, for which from neutron transfer experiments the orbital angular momentum of the transferred neutron was determined to lsub(n) = 2, a decision for spin 3/2$^+$ or 5/2$^+$ could be made. For a number of levels in addition to the spins the multipole mixing parameter of the \-radiation could be determined. Using the obtain multipole mixing parameters and lifetimes from the measurement of Gompf using the Doppler shift attenuation method statements about the excitation character of some levels could be made. For this in the particle-core coupling model a wave function with two components was assumed, a pure particle wave function and a coupled core-particle excitation. By the knowledge of multipole mixing parameter and lifetime the amplitudes of the wave function are determined.

60397 (INIS-mf—7058, pp 549-562) **Spin orientation of the light and the heavy fragments from deep-inelastic reactions induced by ^{16}O at 6 MeV/N.** Duennweber, W.; Hering, W.; Lauterbach, C.; Puchta, H.; Trautmann, W. (Muenchen Univ. (Germany, F.R.). Sektion Physik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The spin alignment of fragments in ^{16}O-induced reactions was studied for both light and heavy fragments by analysing the anisotropy of the gamma (yrast gamma) radiation. It is pointed out that the spin axis fluctuations observed have to be associated with a mechanism coupling the relative motion of the fragments to their intrinsic spins.

60398 (INIS-mf—7058, pp 676-685) **Nuclear structure effects and dynamical deformations in deep inelastic transfer reactions.** Mikheev, V.L.; Artukh, A.G.; Gridnev, G.F.; Kartavenko, V.G.; Mezentsev, A.N.; Popescu, A.; Popescu, D.; Volkov, V.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Differential production cross sections are given for the isotopes of elements with 2<=z<=17 as a function of neutron and proton numbers for the reaction Ag+ ^{40}Ar at 300 MeV. The measured cross sections are compared to the predictions of the diffusion model using both liquid drop and real masses. An attempt is also made to obtain the values of nuclear deformations from the kinetic energies of the DIT products.

60399 (INIS-mf—7074) **High spin states in the odd silver isotopes.** Schuh, H.W. (Koeln Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 3 May 1980. 84p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780660.

Thesis.

At the Cologne FN-tandem accelerator the silver isotopes ^{105}Ag and ^{107}Ag were studied. At the used reactions (^{6}Li,3nγ) and (^{7}Li,4nγ) mainly high spin states were occupied. Thereby levels with spin up to J = 29/2 were detected.

60400 (JINR-R—1-81-617) **Experimental estimation of the momentum distribution of nucleons in the xenon nucleus.** Slovinskij, B.; Okhrimenko, L.S.; Mulas, Eh. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702633.

The investigation of protons emitted in the interaction $\pi^- + Xe \rightarrow p + \pi^- + A'$, at 3.5 GeV/c (A'-residual nucleus) is done. Using the statistical analysis of the experimental data the estimation of the momentum distribution function of peripherical nucleons of the xenon nucleus is obtained. Experimental data are satisfactorily approximated by the Gauss distribution.

60401 (JINR-R—3-81-719) **Parity violation in the 0.75 eV neutron resonance of lanthanum 139.** Alfimenkov, V.P.; Borzakov, S.B.; Vo Van Tkhuan; Mareev, Yu.D.; Pikel'ner, L.B.; Khrykin, A.S.; Sharapov, Eh.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1981. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702634.

The space parity violation in the 0.75 eV neutron resonance of Lantanum (139) was discovered by measuring the transmission of polarized resonance neutrons. The obtained difference of the cross sections due to the change of neutron helicity is $P=(\sigma^+ - \sigma^-)/(\sigma^+ + \sigma^-)=(7.3+-0.5)\times10^{-2}$.

60402 (JINR-R—4-81-740) **High-lying M1 states of spherical nuclei.** Vdovin, A.I.; Ponomarev, V.Yu.; Stoyanov, Ch. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702627.

The cross sections of inelastic scattering of electrons at large angles with excitation of high-lying 1$^+$-states in ^{90}Zr and ^{208}Pb are calculated in DWBA. The calculations are carried out both in the random phase approximation and with the interaction of one- and two-phonon states in the framework of semi-microscopic quasiparticle-phonon model. A group on noncollective 1$^+$- states with a large excitation probability in backward (e, e')- scattering is found in the excitation energy region of 17-21 MeV. The problem of existence, properties, and possibility of discovery the high-lying collective 1$^+$-states (M1-resonance) at excitation energy E>=22 MeV is discussed.

6518 Nuclear Properties And Reactions, A=150-189

REFER ALSO TO CITATION(S) 60391

60403 (BNL—31760) **Intrinsic excitations in deformed nuclei: characteristic predictions of the IBA.** Casten, R.F. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 12p. (CONF-820738—4). NTIS, PC A02/MF A01. Order Number DE82020790.

From INS symposium on dynamics of nuclear collective motion; Mount Fuji, Japan (6 Jul 1982).

Deformed nuclei represent perhaps the largest and best studied class of nuclear level schemes. The Interacting Boson Approximation (IBA) model is devised so as to provide a general framework for the description of low lying collective states in nuclei spanning vibrational, rotational (i.e., deformed) and axially asymmetric types as well as the transitional species intermediate between these limiting cases. The juxtaposition of these two statements makes it all the more surprising that until recently there had been no thorough test of the model in such nuclei. Partly, the explanation for this lies in the type of data required for an adequate test. Since the IBA predicts a broad range of collective states it requires a correspondingly thorough empirical test. Moreover, in deformed nuclei, though the characteristic predictions that distinguish the IBA from the traditional, familiar collective model of harmonic β and γ vibrations are important, their clearest manifestation occurs in very weak, hard-to-detect low energy transitions between excited vibrational bands (in particular between β and γ bands), that had not heretofore been systematically observed. The present brief summary will begin with a review of the properties of the (n,γ) reaction that render it a useful empirical tool for such studies, and follow this with a description of the results of the ^{168}Er study and the application of the IBA model to the resultant level scheme. The discussion will then be generalized to other deformed nuclei and to the inherent systematic predictions that must characterize the IBA for such nuclei. Many of these ideas will be related to the role of finite boson number in the IBA.

60404 (DOE/ER/40048—4L2) **^{180}Ta/sup g,m/ production cross sections form the ^{180}Hf(p,n) reaction.** Norman, E.B.; Renner, T.R.; Grant, P.J. (Washington Univ., Seattle (USA); Argonne National Lab., IL (USA)). 1981. Contract AC06-81ER40048;W-31-109-ENG-38. 18p. NTIS, PC A02/MF A01. Order Number DE82020193.

Portions of document are illegible.

Cross sections have been determined for the production of the J/sup π/ = 1^+ ^{180}Ta/sup g/ and the J/sup π/= 9^- ^{180}Ta/sup m/ from the ^{180}Hf(p,n) reaction. The ^{180}Ta/sup g/ cross sections were determined from measurements of γ-rays emitted following the electron-capture and β-decay of this 8.1-hour state. Total ^{180}Ta production cross sections were determined from measurements of the thick-target (p,n) yield. ^{180}Ta/sup m/ cross sections were calculated by subtracting the ^{180}Ta/sup g/ cross sections from the total (p,n) cross sections. These measurements are compared with the results of a statistical-model evaporation calculation.

60405 (INIS-mf—6819, pp 110) **New data on the decay of A = 152 isobar.** Ganbaatar, N.; Kormitski, Ya.; Mezilev, K.A.; Novikov, Yu.N.; Nurmukhamedov, A.M.; Polyakov, A.G.; Potempa, A.; Tarkani, F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60406 (INIS-mf—6819, pp 112) **Spins of ^{153}Gd excited states populated in the decay of ^{153}Tb.** Konichek, Ya.; Prokhazka, I.; Finger, M.; ShimechkoVa, E.; Shimechek, P.; Tsupko-Sitnikov, V.M.; Mukhonen, J. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60407 (INIS-mf—6819, pp 113) **Interpretation of rotational bands in ^{154}Eu.** Balodis, M.K.; Prokof'ev, P.T.; Kramer, N.D.; Simonova, L.I.; Shrekenbakh, K.; Spits, A.; Van Asse, P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60408 (INIS-mf—6819, pp 121) **New data on the ^{157}Ho → ^{157}Dy decay.** Ganbaatar, N.; Gorozhankin, V.M.; Zvol'ski, I.; Kalinnikov, V.G.; Kuznetsov, V.V.; Stega lov, V.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60409 (INIS-mf—6819, pp 123) **Excited states in ^{161}Dy.** Gromov, K.Ya.; Islamov, T.A.; Lebedev, N.A.; Muminov, T.M.; Salikhbaev, U.S.; Tangabaev, A.A.; Tsoj, E.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60410 (INIS-mf—6819, pp 125) **Strength function structure of β-transitions in lutetium neutron-deficient isotopes with A=162-172.** Bykov, A.A.; Vitman, V.D.; Naumov, Yu.V.; Orlov, S.Yu.; Tarasov, V.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60411 (INIS-mf—6819, pp 138-139) **Excitation of ^{170}Er levels in the (n,n'γ) reaction.** Bondarenko, V.A.; Grigor'ev, E.P.; Prokof'ev, P.T. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60412 (INIS-mf—6819, pp 140) **^{171}Lu decay.** Adam, I.; Gnatovich, V.; Zvol'ska, V.; Zvol'ski, I.; Kratsik, B.; Kugler, A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60413 (INIS-mf—6819, pp 141-142) **Study on the decay of ^{171}Lu, oriented in the gadolinium matrix.** Davaa, S.; Kratsikova, T.I.; Finger, M.; Dupak, Ya.; Konichek, Ya. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60414 (INIS-mf—6819, pp 152) **Study on the decay of sup(183m)Re and sup(180m)W.** Avchukhov, V.D.; Baskova, K.A.; Vovk, A.B.; Sokolov, V.O.; Sorokin, A.A.; Chugaj, T.V.; Shavtvalov, L.Ya. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60415 (INIS-mf—6819, pp 574) **Gamma spectroscopic study of the cross sections of reactor neutron activation of tungsten isotopes.** Bakhmutkin, S.V.; Nosov, A.A.; Rimskij-Korsakov, A.A.; Smirnov, V.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60416 (INIS-mf—6819, pp 621) **Study on multicomponent β-spectra by the β-γ coincidence method.** Budzynski, M.; Gromov, K.Ya.; Kuznetsov, V.V.; Muminov, T.M.; Usmanov, R.R.; Khazratov, T. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60417 (INIS-mf—6968, pp 71-91) **Identification of high spin isomers and nuclear reaction studies for nuclei near N=82.** Jastrzebski, J.; Llukasiak, M.; Moszynski, M.; Preibisz, Z. (Institute of Nuclear Research, Warsaw (Poland)); Gizon, J.; Gizon, A.; Andre, S.; Genevey, J. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

10-20 mg/cm^2 thick ^{141}Pr, ^{144}Sm and ^{147}Sm targets were bombarded with ^{16}O and ^{12}C ions of 70-130 MeV energy from the Grenoble variable energy cyclotron. In the search for high spin isomers the Ge(Li) gamma ray spectra were recorded in coincidence with gamma rays detected by a multiplicity filter consisting of 14 NaI(Tl) detectors. Up to threefold coincidences were recorded during the beam burst and between the bursts. For many target-projectile energy combinations high multiplicity delayed gamma lines were observed indicating the formation of isomers with high excitation energy. The excitation functions for the reaction products were determined from the same measurements, the observed gamma ray being normalized to the target K X-rays. These excitation functions as well as the cross-bombardments allowed in many cases an unambiguous identification of the observed isomers. Seven previously unreported high spin isomers were observed in ^{153}Er, ^{152}Er, ^{152}Ho, ^{151}Ho and ^{149}Dy with delayed multiplicities ranqing from 4 to about 14.

60418 (INIS-mf—7058, pp 510-525) **Pre-equilibrium emission of nucleons in heavy ion collisions.** Bondorf, J.P.; De, J.N.; Karvinen, A.O.T. (Niels Bohr Inst., Copenhagen (Denmark)); Fai, G. (Eoetvoes Lorand Tudomanyegyetem, Budapest (Hungary). Elmeleti Fizikai Intezet); Jakobsson, B.; Randrup, J. (NORDITA, Copenhagen (Denmark)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

It is demonstrated that it is possible to identify the high energy part of the neutron spectrum with the process of quasi-free PEP emission for the reaction ^{12}C+^{158}Gd at 152 MeV. The possible role of other mechanisms (hot spot, friction) is also discussed.

60419 **(INIS-mf—7071) Contributions to a systematic examination of deformed transition nuclei by the study of the decay of ^{188}Tl and ^{190}Tl.** Waetzig, W. (Marburg Univ. (Germany, F.R.). Fachbereich Physikalische Chemie). 30 Jan 1980. 130p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780659.

Thesis.

Using the reaction ^{197}Au(^{3}He,xn) Tl the decay of the nuclides ^{188}Tl and ^{190}Tl to ^{188}Hg (Tsub(1/2) = 70s) respectively to ^{190} Hg(Tsub(1/2) = 3.0 min) was studied at the mass separator ISOCELE of the Orsay-synchrocyclotron by gamma, conversion electron, gamma-gamma coincidence, and electron-gamma coincidence spectroscopy. The level schemes of ^{188}Hg and ^{190}Hg could be remarkably extended in comparison with earlier works. By a statistical analysis of the nuclear level density the nuclear temperature was calculated as a measure for the number of excitation modes of these nuclei.

60420 **(JINR—E-1-81-470) Observation of πsup(-) meson correlated emission in C-Ta interactions at P_0=4.2 GeV/c per nucleon.** Akhababian, N.; Angelov, N.; Baatar, Ts. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 8p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702630.

The effective mass spectra Msub(nπ) of nπ^- (n=2, 3, 4) systems produced in the ^{12}C-^{181}Ta reactions have been experimentally studied at incadent momentum of 4.2 GeV/c per nucleon. The data for this analysis have been obtained from an experiment with the 2-m propane bubble chamber having three 1 mm thick tantalum (A=181) plates. Ratio of the experimental to the background distributions Rsub(n)=Msub(nπ)sup(exper)/Msub(nπ)sup(backgr) for different versions of background, the average values of emission angle of π^- mesons with respect to the direction of the momentum of the whole system of nπ^- mesons and the transverse momentum Psub(T) squared distribution of π^- mesons are presented. Low Psub(T) π^- mesons are observed to be correlated. Correlations in the $3\pi^-$ and $4\pi^-$ systems cannot be explained by the $2\pi^-$ and $3\pi^-$ correlations.

60421 **(JINR-R—1-81-176) Momentum and angular characteristics of πsup(-) mesons produced in the interaction of d, ^{4}He, ^{12}C nuclei with tantalum nuclei at 4.2 GeV/c.** Agakishiev, G.N.; Angelov, N.; Akhababyan, N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702631.

Momentum and angular characteristics of π^- mesons produced at the interaction of light relativistic nuclei d, ^{4}He, ^{12}C with tantalum nuclei are presented. The dependence of momentum and angular spectra of π^- mesons on the nature of a projectile nucleus is studied. The π^- meson distributions over rapidity and Feynman variable x, and correlation in the systems of three and four π^- mesons are analysed. Momentum and angular π^- meson distirbutions weakly depend on the bombarding nucleus nature. Increase of π^- meson multiplicity with bombarding nucleus atomic mass occurs almost identically in all rapidity intervals. In ^{12}C Ta interactions the cumulative π^- meson production in the range of nucleus-target fragmentation is observed.

60422 (OUP—81-09, pp 27-29) **High-spin particle states in A approximately 150 nuclei studied with the (α, ^{3}He) reaction.** Loevhoeiden, G.; Lien, J.R. (Bergen Univ. (Norway). Dept. of Physics); Waddington, J.C. (McMaster Univ., Hamilton, Ontario (Canada)); Rekstad, J.; Espe, I. (Oslo Univ. (Norway). Fysisk Inst.); Gaarde, C.; Larsen, J.S. (Niels Bohr Inst., Copenhagen (Denmark)); van der Werf, S. (Rijksuniversiteit Groningen (Netherlands). Kernfysisch Versneller Inst.). [nd]. Dep. NTIS (US Sales Only).

In Nuclear physics group report - January 1 to December 31, 1980.

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 60385, 60395, 60402, 60419

60423 (INIS-mf—6819, pp 158-159) **Gamma radiation following the ^{208}At → ^{208}Po decay.** Vakhtel', V.M.; Vylov, Ts.; Golovkov, N.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60424 (INIS-mf—6968, pp 109-130) **Continuous spectrum and the excitation of giant resonances in inclusive inelastic reactions with light and heavy ions.** Pollarolo, G. (Istituto Nazionale di Fisica Nucleare, Turin (Italy)); Vitturi, A. (Copenhagen Univ. (Denmark)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The ^{208}Pb(α,α') (at 65 MeV) and the ^{208}Pb(^{16}O,^{16}O') (at 315 MeV) reactions are described in a model where the two nuclei are regarded as a collection of classical vibrators in the surface deformation parameters of the two nuclear systems. The model takes into account both the low-lying modes and the damped giant resonances while describes the relative motion classically.

60425 (INIS-mf—6968, pp 331-355) **TDHF calculations of Kr-induced strongly damped collisions.** Davies, K.T.R. (Oak Ridge National Lab., TN (USA)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Time-dependent mean-field calculations, using an axially symmetric model and Skyrme-type effective interaction, for ^{84}Kr+^{208}Pb at Esub(lab)=494 MeV and for ^{84}Kr+^{209}Bi at Esub(lab)=600 and 714 MeV are described. The calculated fragment energies, the mean masses and the scattering angles are in good agreement with experiment, but the mass and charge distribution widths are an order of magnitude smaller. TDHF calculations for the reaction ^{86}Kr+^{139}La at Esub(lab)=505, 610 and 710 MeV are also reviewed. It is shown that, at all three energies the final kinetic energy loss and angular dependence are only in fair agreement with experiment, the most serious discrepancies occuring for the large-angle (small angular momentum) fully-damped events.

60426 (INIS-mf—6968, pp 21-33) **Isoscalar giant resonances in ^{208}Pb and ^{40}Ca.** Eyrich, W.; Hofmann, A.; Rost, H.; Scheib, U.; Schneider, S.; Vogler, F. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Physikalisches Inst.); Rebel, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik 1). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A study of the giant monopole resonance in ^{40}Ca by measuring hadron scattering at extreme forward angles is described briefly. The advantages of studying the decay of giant resonances by coincidence experiments are summarized. The results of the investigation of the decay of isoscalar resonances in ^{208}Pb via (α',γ) angular correlations are given.

60427 (INIS-mf—6968, pp 99-108) **Experimental investigation of the giant monopole resonance in heavy nuclei.** Morsch, H.P. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Kernphysik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A summary is given on an investigation of the giant monopole excitation in heavy nuclei using α and d scattering of energies up to 43 MeV/nucleon. For α scattering from ^{208}Pb the energy dependence of giant resonance excitations was studied for incident energies between 100 and 172 MeV. Relative to the excitation of the giant quadrupole resonance located at 10.9 MeV the resonance at 13.8 MeV was found to be much stronger excited at higher incident

α energies. Differential cross sections are presented for α and d scattering which are compared to microscopic DWBA calculations. Several models were applied to the monopole excitation, some of them yield cross sections which are not consistent with the data. The use of different transition densities indicates a strong sensitivity of the monopole cross section to details of the excitation mechanism.

60428 (INIS-mf—7058, pp 449-467) **Neutron multiplicities associated with heavy ion induced fission. Comparison with deep inelastic collisions results.** Berlanger, M.; Hanappe, F. (Brussels Univ. (Belgium)); Chechick, R. (Weizmann Inst. of Science, Rehovoth (Israel)); Fuchs, H. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)); Morjean, M.; Peter, J.; Tamain, B. (Centre National de la Recherche Scientifique, 91 - Orsay (France)); Dakowski, M.; Lucas, B.; Mazur, C. 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The 240 MeV Ar+Au system, for which the two mechanisms - fission following fusion and deep inelastic collisions - are observed and clearly resolved was investigated. Neutron multiplicities have been obtained in both cases. For the fission case, the V1/V2 ratio of the numbers of neutrons emitted by the light and heavy fragments respectively varies as the M1/M2 ratio of the fragment masses. For the deep inelastic collisions, V1/V2 is clearly lower than M1/M2. This behaviour difference is interpreted as a scission point shape effect, which is confirmed by the shapes of the neutron energy spectra associated to both fragments.

60429 **(JINR-R—4-81-683) Effect of spin components of residual forces on properties of electric type states in spherical nuclei.** Nguen Din' Dang; Ponomarev, V.Yu. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702626.

Influence of spin components of the effective nuclear forces on the structure of electric type eicited states is investigated. Both the central and spin components of the effective NN-forces are selected in a separable form with the same radial dependence. As is shown, there are no considerable changes in characteristics of the lowest excited states in spherical nuclei as well as in the integral properties of electric resonances (like the region of the localization, the total excitation probability, etc.). Changes in the structure and transition densities for a number of collective states in ^{208}Pb with energies Esub(x)>10 MeV are noted. At an excitation energy Esub(x) approximately 20 MeV the collective states, which are formed by single-particle spin-flip transitions, appear. These states have a small reduced probability B(Elambda; $0^+ \rightarrow$ lambdasup(π)) but they are strongly excited in the inelastic electron stattering at backward angles.

60430 **Proton separation energies of ^{191}Ir and ^{193}Ir.** Lanier, R.G.; Mann, L.G.; Struble, G.L. (California Univ., Livermore (USA). Nuclear Chemistry Div.). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 2/3, 559-560(15 May 1982).

Measurements of (t, α) spectra from targets of sup(191, 193)Ir suggest an inconsistency in the tabulated proton separation energies for these nuclei. We measure ΔSsub(p) = (661 +- 4) keV but obtain (646 +- 8) keV from the tables of Wapstra and Bos.

6520 Nuclear Properties And Reactions, A=220 And Above

REFER ALSO TO CITATION(S) 59543, 59544, 60377, 60460

60431 **(BNL-NCS—31677) Strength of Coriolis Coupling in actinide nuclei.** Peker, L.K.; Rasmussen, J.O.; Hamilton, J.H. (Brookhaven National Lab., Upton, NY (USA); Lawrence Berkeley Lab., CA (USA); Vanderbilt Univ., Nashville, TN (USA)). 1982. Contract AC02-76CH00016. 6p. (CONF-820738—3). NTIS, PC A02/MF A01. Order Number DE82020745.

From INS symposium on dynamics of nuclear collective motion; Mount Fuji, Japan (6 Jul 1982).

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Coriolis Coupling V/sub cor/ plays an important role in deformed nuclei. V/sub cor/ is proportional to $h^2/J[j\ (j+1)-\Omega\ (\Omega+1)]$/sup 1/2/ and therefore is particularly significant in the nuclei with large j and low Ω Nilsson levels close to Fermi surface: n(i/sub 13/2/) in A = 150 to 170 rare-earth nuclei and p(i/sub 13/2/) and n(j/sub 15/2/) in A ≅ 224 actinide nuclei. Because of larger j (n(j/sub 15/2/) versus n(i/sub 13/2/)) and smaller deformations ($\beta \approx 0.22$ versus β 0.28) it was reasonable to expect that in actinide nuclei Coriolis effects are stronger than in the rare earth nuclei. Recently it was realized that the strength of observed Coriolis effects depends not only on the genuine Coriolis Coupling but also on the interplay between Coriolis ad pairing forces which leads to an interference between the wave functions of two mixing rotational bands. As a consequence the effective interaction V/sub eff/ of both bands is an oscillating function of the degree of shell filling (or chemical potential lambda F). It was shown that in the rare earth nuclei this interference strongly influenced conclusions about the trends in the Coriolis coupling strength and explained many of the observed band-mixing features (the sharpness of back banding curves, details of the blocking effect etc.). From theoretical analysis it was concluded that in the majority of actinide nuclei the effective interaction V/sub eff/ is strong, and therefore the Coriolis band-mixing have to be very strong. In this paper we would like to demonstrate that contrary to these predictions experimental data suggest that Coriolis band mixing in studied actinide nuclei is relatively weak and possibly significantly weaker than in rare earth nuclei.

60432 (INIS-mf—6819, pp 296) **Violation and conservation of spatial parity by asymmetry of the ^{233}U and ^{239}Pu on fission by polarized slow neutrons.** Petukhov, A.K.; Petrov, G.A.; Stepanov, S.I.; Nikolaev, D.V.; Zvezdkina, T.K.; Petrova, V.I.; Tyukavin, V.A.; Markova, E.S.; Ivanov, V.V.; Morozov, V.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

60433 (INIS-mf—6937, pp vp) **Updated WIMS library, with ENDF/B-IV based nuclear data for fissile and fertile isotopes, in the resonance region.** Gur, Y.; Caner, M.; Yiftah, S. (Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Center). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beer-shaba, Israel (4 Dec 1980).

60434 (INIS-mf—6968, pp 244-255) **Variance of the energy distributions of fission fragments and large-scale collective nuclear motion.** Lazarev, Yu.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The results of the analysis of a large amount of experimental data on the variance of the energy distributions of fission fragments are presented. It is shown that for heavy nuclei this quantity depends strongly on Z and on the fissility parameter of the initial nucleus. It is pointed out that the calculations within the framework of the existing theories and fission models do not give a satisfactory description of the regularities of the data.

60435 (INIS-SU—109, pp 192-196) **Absolute measurements of the ^{235}U fission cross sections by 2.6 and 8.2 MeV neutrons.** Arl't, R.; Vagner, V.; Grimm, V. (Technische Univ., Dresden (German Democratic Republic)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The absolute fission cross-section measurements of ^{235}U for both 2.6 and 8.2-MeV neutrons are described. The measurement results as well as the error components and the corrections applied are given.

60436 (INIS-SU—109, pp 182-186) **Energy, mass and angular characteristics of ^{235}U fission induced by thermal neutron with lithium and beryllium nucleus emission.** Vorob'ev, A.A.; Grachev, V.T.; Gusev, Yu.I.; Seliverstov, D.M.; Smirnov, N.N. (AN SSSR, Leningrad. Inst. Yadernoj Fiziki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

In the thermal neutron induced fission of ^{235}U energy and angular distributions of nuclei Li and Be have been measured in the range of the emission angles with respect to the direction of light fragments 60-120 deg. Obtained data are analyzed to determine of the production mechanism of light nuclei in ternary fission.

60437 (INIS-SU—109, pp 175-181) **Mechanism of α-particle polar emission in ^{252}Cf spontaneous fission.** Adamov, V.M.; Gusev, S.E.; Drapchinskij, L.V.; Kovalenko, S.S.; Kol'tsov, V.V.; Petrzhak, K.A.; Pleskachevskij, L.A. (Radievyj Inst., Leningrad (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The correlation study of prompt neutrons in Cf-252 spontaneous fission accompanied by polar α-particle emission was carried out. Some conclusions on the polar emission mechanism were made on the base of results obtained.

60438 (INIS-SU—109, pp 171-174) **Fine structure in mass distribution of fission products of odd nuclei.** Teplykh, V.F.; Platygina, E.V.; Petrzhak, K.A. (Leningradskij Tekhnologicheskij Inst. (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Relative cumulative yields of Xe isotopes (A=131-136) are measured by means of the mass-spectrometer method for the fission of ^{237}Np induced by fast and 14 MeV neutrons and 15 and 20 MeV protons. The presence of the fine- structure peak at A=134 is explained by an enhanced probability of production of a pair of fragments with a 82- neutron shell and 62-subshell.

60439 (INIS-SU—109, pp 153-156) **Measurement of independent and cumulative yields of ^{249}Cf thermal fission products.** Gudkov, A.N.; Zhivun, V.M.; Kovalenko, V.V.; Koldobskij, A.B.; Kolobashkin, V.M.; Kosyakov, V.N.; Krivasheev, S.V. (Moskovskij Inzhenerno-Fizicheskij Inst. (USSR); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The 9 independent and 53 cumulative fission product-yields from thermal neutron induced fission of ^{249}Cf are measured by the gamma-rays semiconductor spectroscopy of the unseparated fission products mixture.

60440 (INIS-SU—109, pp 148-152) **Yields of ^{239}Pu photofission products.** Kondrat'ko, M.Ya.; Mosesov, A.V.; Petrzhak, K.A.; Teodorovich, O.A. (Leningradskij Tekhnologicheskij Inst. (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Cumulative yields were determined and total mass yields estimated for 32 masses in Pu-239 photofission with 28-MeV bremsstrahlung using catcherfoil technique and a combination of gamma-spectrometry and chemical methods. Fractional independent yields of Nb-96, I-132, Xe-135, Cs-136, La-140 were measured and mass-yield curve parameters determined.

60441 (INIS-SU—109, pp 109-113) **Neutron spectrum of the ^{252}Cf spontaneous fission in the $3x10^2$-$2x10^6$ eV energy range.** Blinov, M.V.; Vitenko, V.A.; Yurevich, V.I. (Radievyj Inst., Leningrad (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The results of precision measurements made with using improved spectrometer are presented. The energy range of the measurements was essentially expanded. The neutron spectrum in the limits of the experimental errors and uncertainties of cross section of $^6Li(n,\alpha)$ reaction can be approximated by one-parameter Maxwellian distribution (T=1.42 MeV).

60442 (INIS-SU—109, pp 95-98) **Measurement of the average number of prompt neutrons in neutron-induced fission of ^{236}U.** Vorob'eva, V.G.; Kuz'minov, B.D.; Malinovskij, V.V.; Semenova, N.N.; Solov'ev, S.M.; Soloshenkov, P.S. (Radievyj Inst., Leningrad (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The energy dependence of anti νsub(p) for neutron-induced fission of U-236 have been measured in energy range 1.5-3.5 MeV. The influence of the fission fragment pulse discrimination on the measured anti νsub(p) was investigated. Estimated accuracy of measurements was about 1%.

60443 (INIS-SU—109, pp 78-84) **Interpretation of the isomeric shelf phenomenon.** Ostapenko, Yu.B.; Smirenkin, G.N.; Soldatov, A.S.; Tsipenyuk, Yu.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Possibilities of more adequate physical interpretation and analysis of the "isomeric shelf" phenomenon on the basis of detailed experimental investigations of the deep subbarrier photofission yield and fragment angular distributions and on the basis of the new theoretical approach to the description of the subbarrier fission probability are discussed.

60444 (INIS-SU—109, pp 73-77) **Target-nucleus spin effects in fission reactions of even-even nuclei.** Ostapenko, Yu.B.; Smirenkin, G.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Experimental data on the fission probability of even- even nuclei excited in (γ,f), (d,pf), (t,pf) reactions are compared. The target-nucleus spin influence on the fission probability of such nuclei that consists in suppression of the lowest channels K=0 contribution is discussed.

60445 (INIS-SU—109, pp 25-29) **Measurement of neutron-induced fission cross section of ^{248}Cm near threshold.** Fomushkin, Eh.F.; Vinogradov, Yu.I.; Gavrilov, V.V.; Novoselov, G.F.; Surin, V.M.; Zherebtsov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Energy dependence of the fission cross section of Cm- 248 has been measured by means of time-of-flight method in the energy range 0.3<=Esub(n)<=5.5 MeV with the resolution 7.5 nsec/m. The method of the results analysis has been considered, the effective parameters of the fission threshold were determined. Some properties of the curium isotopes fission barriers are discussed.

60446 (INIS-SU—109, pp 20-24) **Study on the light particle yields in spontaneous fission of ^{252}Cf.** Bajer, R.; Dlougy, Z.; Shvanda, Ya. (Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky;; Vil'gel'm, I. (Karlova Univ., Prague (Czechoslovakia)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Yields and energy spectra of light particles emitted in spontaneous fission of ^{252}Cf were measured using the (dE-E) telescope.

Groups of sup(4,6,8)He, sup(6,7,8,9)Li together with a few of heavier nuclei were observed.

60447 (INIS-SU—109, pp 10-12) **Experimental comparison of polar emission intensities in ^{252}Cf and ^{235}U+nsub(th) fission.** Sobolewski, J.; Koczon, P.; Nowicki, L.; Piasecki, E. (Institute of Nuclear Research, Warsaw (Poland)). 1980. Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Light charged particle emission along fission axis was studied experimentally in the same geometry for ^{252}Cf and ^{235}U + nsub(th) fissions. The measured Cf/U probability ratio of the α-particle polar emission is equal to 1.9+-0.3.

60448 (INIS-SU—109, pp 30-34) **Measurement of ^{233}U and ^{235}U fission cross sections in the range of 0.01-100 keV and ^{233}U/^{235}U fission cross section ratio up to 2 MeV.** Mostovaya, T.A.; Mostovoj, V.I.; Biryukov, S.A.; Osochnikov, A.A.; Svettsov, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Fission cross sections of ^{233}U and ^{235}U in the energy range from approximately 1 eV to 100 keV and their ratio - in the range up to 2 MeV are measured by time-of-flight method at the 60 MeV electron linac. These data are compared with results of other groups. The measured ratio in average agrees satisfactorily with other studies data though there are separate point deflections exceeding the error value (approximately 2-3%). These point deflections partially can be connected with an irregular neutron spectrum structure in a beam.

60449 (INIS-SU—109, pp 35-39) **Measurement of ratio of ^{233}U and ^{235}U fission cross section in neutron energy range 0.060-3.28 MeV.** Shpak, D.L.; Korolev, G.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The results of measurements of the fission cross section ratio of the U-233 and U-235 in 0.060-3.28 MeV neutron energy range are presented. As neutron source the reactions Li(p,n) and T(p,n) realized at electrostatic generators are used. As fragment detectors cylindrical glasses are employed. Ratios of ^{233}U and ^{235}U fission cross sections are obtained from results of measurement of angular distributions of fission fragments by the glass technique in 4π geometry. The technique eliminates errors introduced by the dependence of fission fragment angular distributions on neutron energy.

60450 (INIS-SU—109, pp 40-44) **Dependence of GITAsub(f)/GITA value on ^{238}U excitation energy.** Kornilov, N.V.; Sal'nikov, O.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The GITAsub(f)/GITA dependence on ^{238}U excitation energy has been determined from the comparison of the spectra of neutrons emitted before fission with the first neutron spectrum. For calculation of nuclear level density the phenomenological approach has been applied. The agreed description of the reaction cross section (n,2n) and GITAsub(f)/GITA ratio for the ^{238}U nucleus is obtained.

60451 (INIS-SU—109, pp 49-53) **Measurement of the ^{239}Pu, ^{235}U fission cross sections and its ratio in the energy range from 100 eV to 50 keV.** Bergman, A.A.; Kolosovskij, A.G.; Kuznetsov, S.P.; Medvedev, A.N.; Samsonov, A.E.; Tolstikov, V.A. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij; Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Measurement of the ^{239}Pu, ^{235}U fission cross sections and their ratios in the mode of ^{239}Pu, ^{235}U fission events simultaneous registration has been carried out in the neutron energy range from 100 eV to 50 keV. The fission cross sections are normalized by means of a thermalized neutron spectrum in a graphite prism. The conclusion is drawn on the reliability of data obtained for ^{235}U and therefore for ^{239}Pu as well as they are performed by the same technique and simultaneously.

60452 (INIS-SU—109, pp 54-57) **Measurement of the ^{233}U fission cross section and its ratio to ^{235}U fission cross section in energy range from 100 eV to 50 keV.** Bergman, A.A.; Kolosovskij, A.G.; Medvedev, A.N.; Mordovskij, M.V.; Samsonov, A.E.; Tolstikov, V.A. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij; Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The neutron spectrometer of the neutron moderation-time method in lead has been used to perform measurements of the ^{233}U fission cross section and its ratio to the ^{235}U fission cross section in the mode of simultaneous registration of ^{233}U and ^{235}U fission events. Cross section normalization is carried out by means of a thermalized neutron spectrum. A good agreement of results obtained with other authors data is pointed out. It may be assumed that the values of ^{233}U and ^{235}U cross sections obtained are reliable as they are fulfilled by the same technique and simultaneously.

60453 (INIS-SU—109, pp 58-62) **Lifetime of nuclei, formed by deuteron bombardment of ^{235}U.** Melikov, Yu.V.; Syutkina, L.N.; Tulinov, A.F.; Chechenin, N.G.; Yuminov, O.A. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The shadow method has been used to observe the effect of the finite lifetime of fissioning nuclei formed by the bombardment of $^{235}UO_2$ single crystal with deuterons with energies from 10 to 14 MeV. The analysis has shown that this effect is due to the fission of the ^{235}Np nucleus obtained as a result of the two neutron emission by the ^{237}Np compound nucleus.

60454 (INIS-SU—109, pp 63-67) **Lifetimes of ^{236}U compound nuclei produced at neutron absorption by ^{235}U.** Vorotnikov, P.E.; Grusha, O.V.; Eremin, N.V.; Kordyukevich, V.O.; Larionov, L.S.; Melikov, Yu.V.; Syutkina, L.N.; Tulinov, A.F.; Chechenin, N.G.; Yuminov, O.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The energy dependence of the lifetime of ^{236}U compound nuclei produced in the ^{235}U(n,f) reaction at Esub(n)=0.23-4.1 MeV has been investigated using the shadow effect. Experimental data are compared with the results of theoretical calculations based on the statistical model of nuclear reactions. The satisfactory agreement between theory and experiment for the dependence of the ^{236}U nucleus lifetime on excitation energy in the region above 8 MeV is observed. The tendency pointed out previously by the authors to essential discrepancy of these dependences in the mentioned excitation region has not been confirmed.

60455 (INIS-SU—109, pp 157-160) **Angular anisotropy of ^{232}Th fixed fission fragments.** Gokhberg, B.M.; Kozlov, L.D.; Lisin, S.K.; Morozov, L.N.; Pchelin, V.A.; Chistyakov, L.V.; Shigin, V.A.; Shubko, V.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The angular anisotropy of a number of fragments at the ^{232}Th fission by neutrons at 1.58 MeV has been measured. The radiochemical deposition of fragments has been used. It has been found that the fragment anisotropy with the lowest yield studied is highly different as compared with that with high yield fragments. The result obtained testifies to the fact that the fragment mass distribution is formed at the outer fission barrier.

60456 (INIS-SU—109, pp 267-269) **Neutron capture rate in ^{238}U in macroscopic medium.** Dulin, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The results of the study of ^{238}U resonance self- shielding effects are stated by means of measurement and calculation of reduction effects. The experimental reduction of the self-shielding ^{238}U capture cross-section in macroscopic media are described. A more resonance self-shielding effects are made for a good predictions of this experiments.

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 60346, 60403, 60424, 60429, 60500

60457 (FRNC-TH—1054) **Development of mean field theories in nuclear physics and in desordered media.** Orland, H. (Paris-11 Univ., 91 - Orsay (France)). Apr 1981. 245p. (In French). NTIS (US Sales Only), PC A11/MF A01.

Thesis.

This work, in two parts, deals with the development of mean field theories in nuclear physics (nuclei in balance and collisions of heavy ions) as well as in disordered media. In the first part, two different ways of tackling the problem of developments around mean field theories are explained. Possessing an approach wave function for the system, the natural idea for including the correlations is to develop the exact wave function of the system around the mean field wave function. The first two chapters show two different ways of dealing with this problem: the perturbative approach - Hartree-Fock equations with two body collisions and functional methods. In the second part: mean field theory for spin glasses. The problem for spin glasses is to construct a physically acceptable mean field theory. The importance of this problem in statistical mechanics is linked to the fact that the mean field theory provides a qualitative description of the low temperature phase and is the starting point needed for using more sophisticated methods (renormalization group). Two approaches to this problem are presented, one based on the Sherrington-Kirkpatrick model and the other based on a model of spins with purely local disorder and competitive interaction between the spins.

60458 (INIS-mf—6968, pp 8-70) **Electromagnetic transitions in rotating nuclei.** Hamamoto, I. (NORDITA, Copenhagen (Denmark)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

By exploiting the wave functions of the cranking model the author investigates electromagnetic transitions both within a band and between bands. The systematics of the expected patterns for dipole transitions at high rotational frequencies is explored. Several characteristic features of the behaviour of the transition matrix-elements have been obtained, which are essentially different from what is obtained from the perturbative treatment of rotational effect. The dependence of polarization charge on rotational frequency is also discussed.

60459 (INIS-mf—6968, pp 131-151) **Description of giant resonances within the quasiparticle-phonon nuclear model.** Soloviev, V.G.; Vdovin, A.I. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The strength function and other properties of various giant electric and magnetic multiple resonances are calculated in the framework of the semimicroscopic quasiparticle-phonon nuclear model. Most calculations are performed both in random phase approximation and taking into account the interaction between the one and two-phonon states.

60460 (INIS-mf—6968, pp 180-197) **Angular momenta of fission fragments.** Dietrich, K. (Muenchen Univ. (Germany, F.R.). Sektion Physik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

It is shown how the angular momenta of nascent fragments are related to bending modes in the scission region. Quantum numbers important for the angular momentum distribution are revealed. The predictions of a model calculation are compared to experimental results.

60461 (INIS-mf—6968, pp 198-207) **Application of dynamical Thomas-Fermi-theory to nuclear collective motion.** Eckart, G.; Holzwarth, G. (Gesamthochschule Siegen (Germany, F.R.)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Transition densities and currents are dynamically determined from a fluid dynamical formalism for self binding fermion systems using a dynamical Thomas-Fermi functional accounting for the distortions of Fermi-spheres.

60462 (INIS-mf—6968, pp 208-221) **Quantized mean field theories for large amplitude motion.** Goeke, K. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.); Reinhard, P.G. (Mainz Univ. (Germany, F.R.). Inst. fuer Kernphysik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A comparison of two basic sorts of large amplitude collective theories, namely the generator coordinate method and classical approaches like adiabatic time dependent Hartree-Fock and their quantized version has been presented. This required a generalization of GCM to one which uses RPA correlated states, or equivalently one which uses a pair of conjugate parameters and Slater determinants. The GCM variational principle has been generalized to include the variation of the collective path. This then reproduced the ATDHF equations. The eventual outcome of the present theory is a collective Schroedinger equation, which fully agrees with the one obtained by a consistent quantization of the classical ATDHF Hamiltonian function H(q,p). Thus both approaches converge to a unified description of large amplitude collective motion.

60463 (INIS-mf—6968, pp 222-238) **Theory of quantized collective frictional motion.** Hasse, R.W. (Muenchen Univ. (Germany, F.R.). Sektion Physik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A scheme is presented which leads from the many-body Schroedinger equation by use of time-dependent perturbation theory at zero temperature for a weak coupling between the intrinsic and collective coordinates of a nucleus via the reduced Liouville equation to a collective Schroedinger equation. The resulting collective Hamiltonian, Hsub(c), contains the frictional force in the nonlinear term and the quantum fluctuations in the nonhermitean term. The conservative part of Hsub(c) contains the kinetic energy, the conservative potential, and a correction potential. During the course of derivation, microscopic expressions for the friction and diffusion constants and the correction potential emerge. Solutions of the time-dependent Schroedinger equation with the Hamiltonian Hsub(c) for up to quadratic conservative potentials are ordinary Gaussian wave packects which travel along classical damped trajectories, spread like Fokker-Planck distribution functions and conserve the norm. The theory is applied to the problem of radiation damping. For deep-inelastic heavy-ion scattering, a two dimensional numerical solution of a simplified version of Hsub(c) with a realistic conservative potential, constant friction and vanishing diffusion constants is presented. For a trajectory with energy slightly above barrier, the wave packet splits up into a reflected and a transmitted part.

60464 (INIS-mf—6968, pp 239-243) **Nuclear potentials and nonlinear differential equations.** Gridnev, K.A.; Mikulas, K. (Leningradskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Fizicheskij Inst.); Hefter, E.F. (Hannover Univ. (Germany, F.R.). Inst. fuer Theoretische Physik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A link is established between the nonlinear Schroedinger and Kortweg-de Vries equations and a phenomenological effective surface potential capable of describing reactions involving composite particles. It is shown that the use of these equations together with the inverse scattering method allows a more consistent interpretation of potential terms applied so far.

60465 (INIS-mf—6968, pp 256-270) **Time-dependent density matrix formalism for relaxation processes in nucleon-induced nuclear reactions.** Maedler, P.; Reif, R. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The relaxation of the intrinsic degrees of freedom is studied in nucleon-induced precompound reactions. The equilibration process in the hydrodynamic stage is described by using a time-dependent density matrix formalism. The dependence of the relaxation time on the energy and on the mass number is determined. Both precompound and compound particle spectra as well as angular distributions are calculated.

60466 (INIS-mf—6968, pp 271-281) **TDHF, ATDHF and constrained HF calculations.** Nemeth, J. (Eoetvoes Lorand Tudomanyegyetem, Budapest (Hungary). Elmeleti Fizikai Intezet). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The adiabatic time-dependent Hartree-Fock (ATDHF) equations of Villars are deduced in coordinate space representation. For fissioning slabs a comparison is made between ATDHF and TDHF calculations and it is shown that owing to the small amount of dissipation the ATDHF results are reliable only for processes occuring within 10^{-22} s.

60467 (INIS-mf—6968, pp 282-296) **Dynamics of nuclear fission and heavy-ion reactions.** Nix, J.R.; Sierk, A.J. (Los Alamos Scientific Lab., NM (USA)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Large amplitude collective motion in fission and heavy ion reactions is studied by solving the classical equations of motion for the time evolution of the nuclear shape. It is shown that by using the generalized surface energy obtained on the basis of the requirement that two semi-infinite slabs of constant density nuclear matter have minimum energy at zero separation one can reproduce the heavy ion elastic scattering.

60468 (INIS-mf—6968, pp 297-303) **Irrotational flow motion and TDHF solutions.** Quentin, P.; Vautherin, D. (Centre National de la Recherche Scientifique, 91 - Orsay (France)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A simple prescription is proposed to extract from any given TDHF solution an optimal irrotational flow motion. It is based on the Baranger-Veneroni decomposition theorem valid for any one-body reduced density matrix specifying the TDHF solution.

60469 (INIS-mf—6968, pp 313-320) **Sp(3,R) model of collective states.** Rosensteel, G. (Tulane Univ., New Orleans, LA (USA)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

It is explained that the union of the rotational model with the harmonic oscillator shell model can be achieved by adjoining the harmonic oscillator Hamiltonian to rot(3) in the symplectic algebra, sp(3,R). It is shown that this way the monopole and β vibrations are explained in a natural manner.

60470 (INIS-mf—6968, pp 321-328) **Collective motions as Hamiltonian subdynamics of the many-particle dynamics.** Rowe, D.J. (Toronto Univ., Ontario (Canada). Dept. of Physics). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The problem of extracting a Hamiltonian subdynamics, described in a few collective variables, from the microscopic many-body dynamics is exposed. Then it is shown that the Sp(3,R) collective Hamiltonian is simply the restriction of the microscopic shell model Hamiltonian to an appropriate irreducible Sp(3,R) representation.

60471 (INIS-mf—6968, pp 356-360) **Use of TDHF solutions in a theory of collective paths and in a theory of nuclear reactions.** Giraud, B.G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A method for gaining cross sections from TDHF results is described briefly. A metric is defined for parameter-dependent wave functions leading to a geometrical description of collective motion. It is shown that the real and imaginary parts of the TDHF Hamiltonian provide a collective algebra.

60472 (INIS-mf—6968, pp 378-386) **TDHF calculation of fusion cross sections for light and medium mass systems.** Krieger, S.J. (Illinois Univ., Chicago (USA). Dept. of Physics). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Fusion cross sections are computed in the sharp cutoff approximation using the results of TDHF calculations for the systems $^{16}O+^{12}C$, $^{18}O+^{12}C$, $^{16}O+^{16}O$, $^{16}O+^{40}Ca$, $^{28}Si+^{28}Si$, and $^{40}Ca+^{40}Ca$. The results are in generally good agreement with experiment. A fusion window in the angular momentum-energy plane, as obtained in calculations of the system $^{28}Si+^{28}Si$, is consistent with an interpretation of experimental results for the similar system $^{32}S+^{27}Al$.

60473 (INIS-mf—6968, pp 387-399) **Nuclear dynamics beyond the time-dependent Hartree-Fock approximation.** Negele, J.W. (Massachusetts Inst. of Tech., Cambridge (USA). Center for Theoretical Physics). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Two complementary theoretical frameworks to go beyond TDHF - the quantum mean field approximation useful for bound states and tunneling and the coupled cluster expansion valid for the high energy domain - are described briefly.

60474 (INIS-mf—6968, pp 400-409) **Approach to thermal equilibrium.** Wong, C.Y.; Toepffer, C. (Oak Ridge National Lab., TN (USA)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The authors determine the thermal relaxation time for the approach to thermal equilibrium by solving the Uehling-Uhlenbeck equation. The initial momentum distribution is taken to be a sphere with an outer spherical shell. It is found that thermal equilibrium is essentially reached within a time of about 40 fm/c ($=1.33\times10^{-22}$ sec). The order of magnitude of this relaxation time agrees with that inferred from recent deep-inelastic heavy-ion experiments.

60475 **(INIS-mf—7053) Special resonances in two- and three-cluster systems.** Orlowski, M. (Tuebingen Univ. (Germany, F.R.). Fakultaet fuer Physik). 20 Dec 1979. 141p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780656.

Thesis.

In the framework of Schmid's N-cluster theory the resonance theory of Wildermuth-Benoehr is extended to three clusters. This three-cluster resonance model is solved in a mathematically exact formalism. The main topic of this formalism is the asymptotic behaviour of the full three-body-resolvent in the differential directions of the six-dimensional position space of the Jacobi coordinates. The scattering amplitudes and cross sections in all two-body channels and breakup are explicitly presented. Furthermore a very illustrative kinematical three-body model, the so called 'three-body-neb', is developed. Special regards in this connection are devoted to the analysis of possible interference possibilities of the main three-body-resonance with other resonance types of the three-body model. In a further section the Pauli-resonances are studied i) in the Wildermuth resonating group theory, ii) in Schmid's simulation models. It is shown under which circumstances Pauli-resonances may be positive energy bound states.

60476 (INIS-mf—7055) **Microscopic model for the calculation of the energy dependent optical nucleus-nucleus.** Mueller, K. (Technische Hochschule Darmstadt (Germany, F.R.). Fachbereich Physik). 25 Jun 1979. 108p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780657.

Thesis.

In this thesis in the framwork of a microscopic model the energy dependence of the real and imaginary part of the optical nucleus-nucleus potential was studied. The local energy difference and the local absorptive potential per nucleon were defermined by the effective inter action between the nucleon pairs of the penetrating nuclei. This effective interaction was determined using the Gsub(T+P) operator of an extended Bethe-Goldstone equation for a medium consisting of two penetrating systems of nuclear matter. The resulting imaginary part of the effective interactions was interpreted as an absorptive potential determining the incoherent part of the imaginary part of the nucleus-nucleus potential. The assumption that the interaction is determined by the local fermi momenta was justified by the short range of the effective nucleon-nucleon force.

60477 (INIS-mf—7058, pp 482-509) **Mechanism of multifragmentation of heavy ions.** Bondorf, J.P. (Niels Bohr Inst., Copenhagen (Denmark)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The known features of heavy ion collisions in the conventional energy intervals are summarized on a "phase-diagram". The "hot spot" mechanisms supposed to be capable to describe reactions at 100 MeVA in near central and more peripheral reactions are explained in some detail.

60478 (INIS-mf—7058, pp 526-532) **Resonances in heavy-ion reactions as orbiting-cluster phenomena.** Cindro, N.; Pocanic, D. (Institut Rudjer Boskovic, Zagreb (Yugoslavia)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A model is proposed to interpret the existing evidence on resonances in heavy ion reactions in a unified way, assuming that the phenomenon is related to orbiting cluster molecular type configurations. Based on this interpretation predictions are given of nuclear systems most likely to exhibit resonances and of the energy vs. spin relation of these relation.

60479 (INIS-mf—7058, pp 563-574) **Long-range polarization potential induced by multiple Coulomb excitation.** Froebrich, P.; Lipperheide, R. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.); Freie Univ. Berlin (Germany, F.R.)); Fiedeldey, H. (South Africa Univ., Pretoria. Dept. of Physics). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A local, complex, l-independent potential is determined, which fully describes the multiple Coulomb excitation. The potential is obtained in numerical form by solving the inverse problem for the elastic component of the multiple Coulomb excitation S matrix. It is shown that for systems in which multiple excitation is important, the present potential differs quite significantly from the known single excitation form.

60480 (INIS-mf—7058, pp 575-586) **New type of strongly damped collisions.** Freiesleben, H. (Technische Hochschule Darmstadt (Germany, F.R.)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

Based on data from various heavy ion induced reactions evidence is shown for a new type of strongly damped collisions. The reaction proceeds slower than a diffusion process but it is faster than a fully equilibrated compound nucleus decay and there is some evidence indicating that the process occurs outside the saddle point. This intermediate reaction is evidenced by very broad symmetric mass and very broad energy distributions.

60481 (INIS-mf—7058, pp 601-617) **In search of high density collective phenomena in nuclear collisions.** Gyulassy, M. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The progress made toward uncovering signatures of collective phenomena is reviewed. Elements of the basic reaction mechanism leading to a complex background are first discussed. Possible hints of collective phenomena in proton and pion single and double inclusive spectra as well as π-multiplicity data are then described.

60482 (INIS-mf—7058, pp 618-622) **Phase relations and excitation mechanism in heavy-ion scattering.** Hentschel, E.; Wohlfarth, D.; Thomas, H.J.; Grambole, D. (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)); Manko, V.I.; Novatzki, G.B.; Sakuta, S.B.; Stepanov, D.N.; Tshuev, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

It is shown how the mechanism of nuclear excitation during a scattering process can be seen in the phase relations between the elastic and inelastic channels. First the simplest situation where the excitation consists of only one transfer of conserved quantities like energy or angular momentum is described. In the second part the couplings of more than two channels are considered.

60483 (INIS-mf—7058, pp 623-661) **Dissipation and nuclear collective motion.** Hofmann, H. (Technische Univ. Muenchen, Garching (Germany, F.R.). Fachbereich Physik); Jensen, A.S. (Aarhus Univ. (Denmark). Inst. of Physics); Ngo, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Siemens, P.J. (Niels Bohr Inst., Copenhagen (Denmark); California Univ., Berkeley (USA). Lawrence Berkeley Lab.). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The paper contains new results on the following subjects: numerical computations of response functions and transport coefficients; dissipation in a self-consistent treatment of harmonic vibrations; introduction of collective variables within a quantum theory (the method used consists of an extended version of the Bohm and Pines treatment of the electron gas and it allows to deduce a quantum Hamiltonian for the collective and intrinsic motion including coupling terms); discussion and solution of a quantal Master equation for non-linear collective motion. Additionally, a discussion of the problems of irreversibility is given.

60484 (INIS-mf—7058, pp 686-703) **Angular momentum and the collective modes excited in deep-inelastic processes and in fission.** Moretto, L.G. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The angular momentum effects in deep inelastic processes and fission have been studied in the limit of statistical equilibrium. The model consists of two touching liquid drop spheres. Angular momentum fractionation has been found to occur along the mass asymmetry coordinate. Thermal excitation of fragment spin is predicted to occur in the degrees of freedom which can bear angular momentum, like wriggling, tilting, bending, and twisting.

60485 (INIS-mf—7058, pp 704-715) **Initial correlations and transport theory of dissipative heavy-ion collisions.** Noerenberg, W.; Riedel, C. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

In order to include initial correlations in the transport theory of dissipative collisions the authors introduce an explicitly time-dependent dynamical potential in the relative motion. Consequences of the initial correlations are discussed. The resulting Fokker-Planck equation is applied to compound-nucleus formation and dissipative collisions. The possible existence and some characteristic features of a long-living component of dissipative collisions are studied.

60486 (INIS-mf—7058, pp 734-749) **Transfer-induced transport in nuclear collisions.** Randrup, J. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.; NORDITA, Copenhagen (Denmark)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

A simple model is proposed to describe the transfer-induced transport in damped nuclear collisions. The model describes the dinuclear complex as two Fermi gases in relative motion. The transport coefficients are derived for the macroscopic variables characterising the dinucleus. For the relation between the energy loss and the mass dispersion an approximately universal behaviour is predicted.

60487 (INIS-mf—7058, pp 750-760) **Angular momentum dissipation and orientation in deep inelastic heavy ion collisions.** Schmidt, R. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics); Reif, R. (Technische Univ., Dresden (German Democratic Republic). Sektion Physik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The angular momentum dissipation in DIC as well as related fragment orientation phenomena are investigated treating the relative motion of the ions dynamically. A two dimensional classical model with a diagonal friction tensor is used to set up Newton type equations of motion for the mean values of the macroscopic variables. The changes caused by the inclusion of fluctuations in the dissipated angular momentum are also taken into account. The predictions of the model are shown to be in fair agreement with the experimental results.

60488 (INIS-mf—7058, pp 761-823) **Evidence for the occurence of shock phenomena in relativistic heavy ion collisions.** Stoecker, H.; Hofmann, J.; Buchwald, G.; Maruhn, J.A.; Greiner, W. (Frankfurt Univ. (Germany, F.R.). Inst. fuer Theoretische Physik). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

In the present paper the authors develop the essential theoretical tools for the treatment of the dynamics of high energy heavy ion collisions. They study the influence of the nuclear equation of state and discuss the new phenomena connected with phase transitions in nuclear matter (pion condensation). Furthermore they investigate the possibility of a transition from nuclear to quark matter in high energy heavy ion collisions. In this context exotic phenomena like strongly bound pionic states, limiting temperatures, and exotic nuclei are discussed.

60489 (INIS-mf—7058, pp 587-600) **Study of a fast collective mode in deep inelastic reactions: quantum fluctuations.** Gregoire, C.; Lucas, R.; Ngo, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Hofmann, H. (Centre National de la Recherche Scientifique, 91 - Orsay (France)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The latest experimental developments in charge equilibrium studies for deep inelastic reactions are reviewed. The data at equilibrium are interpreted in terms of a static model. A quantum master equation is derived for treating the dynamics of fast collective modes and applied to the charge equilibration degree of freedom.

60490 (INIS-mf—7058, pp 533-548) **Viscous relativistic hydrodynamical calculations for heavy-ion collisions in one-dimension.** Csernai, L.P.; Barz, H.W.; Lukacs, B.; Zimanyi, J. (Koezponti Fizikai Kutato Intezet, Budapest (Hungary)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The deficiencies of the hydrodynamical description of heavy ion reactions without the viscosity terms are pointed out. In a one dimensional model containing the viscous terms the changes of the temperature and the density in the function of time are determined in both the compression and in the expansion stage of the reaction. The influence of viscosity on the double differential distribution is also investigated.

60491 (INIS-mf—7058, pp 662-672) **Phase transition in energetic heavy ion collision.** Lukacs, B.; Csernai, L.P. (Koezponti Fizikai Kutato Intezet, Budapest (Hungary)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The limits of using one-phase thermodynamics together with a hydrodynamical model to describe heavy ion collisions are investigated. An explicit way is given to calculate the dynamics of a first order phase transition. Various possible ways of behaviour of nuclear matter during instability are pointed out.

60492 (INIS-mf—7058, pp 824-839) **Statistical model of energetic central collisions of heavy ions.** Zimanyi, J. (Koezponti Fizikai Kutato Intezet, Budapest (Hungary)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

The three phases of central heavy ion reactions (ignition phase, expansion phase and break up stage) are quatitatively described in a simple model based on the subsequent application of geometric picture, hadrochemical equations, hydrodynamic description. The possibility of the Bose-Einstein condensation of pions is also pointed out.

60493 (INIS-mf—7058, pp 840-848) **"Bose-Einstein condensation" of pions in energetic heavy ion collisions.** Zimanyi, J. (Koezponti Fizikai Kutato Intezet, Budapest (Hungary)); Fai, G. (Eoetvoes Lorand Tudomanyegyetem, Budapest (Hungary). Elmeleti Fizikai Intezet); Jakobsson, B. (NORDITA, Copenhagen (Denmark)). 1979. Dep. NTIS (US Sales Only).

From Conference on large amplitude collective nuclear motion; Lake Balaton, Hungary (10 Jun 1979).

It is shown how the equivalent of Bose-Einstein condensation of pions in a large enough volume would appear in the experimental data obtained in a heavy ion reaction.

60494 **(ITF—80-140E) Fluctuations of the parameters determining the nuclear shape in the proper coordinate system.** Filippov, G.F.; Ovcharenko, V.I.; Weaver, O.L. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Dec 1980. 40p. Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

Portions of document are illegible.

Within the framework of the generalized hyperspherical function method, the dispersion of the parameters which determine the nuclear shape in the ellipsoid-of-inertia principal axis system is studied. Comparison of the fluctuation amplitude of the quantities determining the nuclear shape with their mean values enables one to make a conclusion on static deformation as well as to study the character of the nuclear shape change under collective excitations.

60495 **(JINR—E-4-81-636) Fine structure of the RMS radius.** Vegh, L. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 6p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702622.

The fine structure of nuclear mean square charge radius found in experimental data is discussed within a simple phenomenological model. The assumption of spherical nuclear shape is accepted. The observed simple trends including the shell effects can be well explained by small surface effects related to the degree of the valence shell population.

60496 (KFTI—80-6, pp 21-22) **Program for self-consistent calculations of non-spheric nuclei.** Tarasov, V.N.; Kirichenko, Yu.V.; Gonchar, V.Yu.; Inopin, E.V. 1980. (In Russian). Dep. NTIS (US Sales Only).

From Hadron electromagnetic interactions in the resonance energy range; Kharkov, Ukrainian SSR (30 May 1979).

A program has been developed for calculating the properties of axially deformed nuclei by the Hartree-Fock method with the Skyrma interaction. The wave functions are expanded in the wave functions of a harmonic oscillator. The maximum dimension of the basis is 286 functions (11 oscillatory shells). The program has been realized in the FORTRAN languaqe for the BESM-6 computer and makes it possible to compute nuclear deformation of light and rare earth nuclei.

60497 **(LA-UR—82-2528) Application of nuclear models to neutron nuclear cross section calculations.** Young, P.G. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 13p. (CONF-820942—1). NTIS, PC A02/MF A01. Order Number DE82021694.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

Nuclear theory is used increasingly to supplement and extend the nuclear data base that is available for applied studies. Areas where theoretical calculations are most important include the determination of neutron cross sections for unstable fission products and transactinide nuclei in fission reactor or nuclear waste calculations and for meeting the extensive dosimetry, activation, and neutronic data needs associated with fusion reactor development, especially for neutron energies above 14 MeV. Considerable progress has been made in the use of nuclear models for data evaluation and, particularly, in the methods used to derive physically meaningful parameters for model calculations. Theoretical studies frequently involve use of spherical and deformed optical models, Hauser-Feshbach statistical theory, preequilibrium theory, direct-reaction theory, and often make use of gamma-ray strength function models and phenomenological (or microscopic) level density prescriptions. The development, application, and limitations of nuclear models for data evaluation are discussed, with emphasis on the 0.1 to 50 MeV energy range. (91 references).

60498 **(LBL—14641) Behavior of nuclei at high angular momentum.** Stephens, F.S. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 22p. (CONF-820738—2). NTIS, PC A02/MF A01. Order Number DE82020267.

From INS symposium on dynamics of nuclear collective motion; Mount Fuji, Japan (6 Jul 1982).

Portions of document are illegible.

The present report begins with a brief overview of nuclear shapes and level structures at high-spin values. The new spectroscopy associated with angular-momentum alignments is described, and some of the exciting possibilities of this spectroscopy are explored. Nuclear moments of inertia are discussed and a somewhat different one is defined, together with a method for measuring it and some early results. Finally a few comments on the future prospects for high-spin physics are offered.

60499 **(UCRL—88037) Science and art in heavy-ion collisions.** Weiss, M.S. (Lawrence Livermore National Lab., CA (USA)). 9 Aug 1982. Contract W-7405-ENG-48. 19p. (CONF-820654—3). NTIS, PC A02/MF A01. Order Number DE82020497.

From International symposium on time dependent Hartree-Fock and beyond; Bad Honnef, F.R. Germany (7 Jun 1982).

One of the more intriguing phenomena discovered in heavy-ion physics is the seeming appearance of high energy structure in the excitation spectra of inelastically scattered heavy ions. For reasons illustrated, these may well be a phenomena unique to heavy ions and their explanation perhaps unique to TDHF.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 60053, 60144, 60674

60500 **(EUR—7164) Nuclear data guide for reactor neutron metrology. Part I: Activation reactions (1979 edition). Part II: Fission reactions (1979 edition).** Zijp, W.L.; Baard, J.H. (Commission of the European Communities, Petten (Netherlands). Joint Nuclear Research Center). 1981. 241p. NTIS (US Sales Only), PC A11/MF A01. Order Number DE82702628.

Part I lists numerical data on activation detector materials, on detection reactions involved, and on radionuclides produced. The data are mainly taken from existing evaluations. Where evaluations were missing, unknown or obsolete, data were taken from recent literature. The detection reactions considered were selected on the basis of available information of its use for reactor neutron measurements. In the opinion of the Euratom Working Group on Reactor Dosimetry (EWGRD) this document may contribute to the creation of a common data set for all laboratories working in the field of reactor neutron metrology. Part II lists numerical data on fission reactions, the cross-section data and the decay data of some fission product radionuclides, suitable for gamma counting. The selection of data is based on the usefulness to determine neutron flux densities, neutron fluences and neutron spectra. The data are mainly taken from existing review papers and evaluations. It is expected that after one or two years an updated and revised guide will be issued. The present document supersedes the previous report ECN-37.

60501 **(FEI—1226) Constants and computer codes library for gamma transport calculations by the Monte Carlo method.** Androsenko, P.A.; Bolonkina, G.V.; Nekrasov, E.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1981. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702619.

Gamma library oriented for detailed account of gamma interactions with matter in Monte-Carlo calculations is described in a nutshell. Such processes as photoeffect, pair production and scattering on bound electrons are taken into consideration. To describe anisotropy of the Compton effect the Klein-Nishina-Tamm law is assumed to be valid. "Standard" and service computer codes enabling one to calculate a cross section of a certain composition are the constituents of the library; they also make it possible to calculate cross sections as a function of energy while computing, to simulate the Klein-Nishina-Tamm law, and to employ the local evaluation.

60502 (INIS-SU—25, pp 118-122) **Effect of composition of three-layer barriers on the transmission characteristics of reactor neutrons.** Goryachev, I.V.; Mokhov, A.S.; Trykov, L.A. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 2. all-union conference on ionizing radiation protection of industrial nuclear plants; Moscow, USSR (19 Dec 1978).

The effects of composition and structure of three-layer barriers (steel-polyethylene-steel, aluminium-polyethylene aluminium) on the transmission of reactor neutrons and accompanying secondary gamma radiation have been experimentally and theoretically studied. The calculations were carried out by the Monte Carlo method using the 26-group ARAMAKO data library taking into account the resonance and heterogeneous effects. The experiments

were performed at a research zero power reactor, the ratio of neutron-to-gamma dose in the initial beam being 10:1. The dependences of the neutron and gamma dose transmission coefficients for steel and aluminium stacks (110 and 115 mm thick respectively) on the location of a 10 mm thick polyethylene sheet along the stacks are presented. The dependences are of an extremum character for the steel compositions, and of a monotonous one for the aluminium compositions. Maximum discrepancies between the measured and calculated values do not exceed 2-3% for the whole set of different compositions.

60503 (INIS-SU—25, pp 6-19) **Comparison of calculations with the results of reference experiments.** Bolyatko, V.V.; Vyrskii, M.Yu.; Mashkovich, V.P.; Sakharov, V.K. 1979. (In Russian). Dep. NTIS (US Sales Only).

From 2. all-union conference on ionizing radiation protection of industrial nuclear plants; Moscow, USSR (19 Dec 1978).

Comparative evaluations of four reference experimental tests on neutron and gamma transport in matter and the calculations carried out by different authors have been performed. In all the tasks considered there have been measured or calculated corresponding spatial and energy distributions of gamma-and neutron-flux. The reference tests and calculational techniques are described for the following tasks: gamma transport from a disk isotropic source in different media (the results are presented for water); fission neutron transport from a disk isotropic natural uranium source in steel shields of different thickness; fast reactor leakage neutron transport in a heterogeneous multilayer steel-graphite shield; neutron transport from a point isotropic source in the center of the sphere at the surfaces of iron spheres. A general conclusion is made that the inconsistency observed between calculated and experimental data exceeds the errors of the calculated data reported by the authors.

60504 (INIS-SU—25, pp 85-92) **Neutron and gamma albedo characteristics for two-layer aluminium-air scatterers.** Sazykin, B.V. 1979. Dep. NTIS (US Sales Only).

From 2. all-union conference on ionizing radiation protection of industrial nuclear plants; Moscow, USSR (19 Dec 1978).

Different neutron and gamma albedo characteristics for two-layer aluminium-air reflectors have been studied by the Monte Carlo method applied to unidirectional sources. Thus calculated integral spectral and differential numerical albedo for different neutron energy groups as functions of the incidence angle $THETA_0$ and the scattering angle THETA are presented. The strongest azimuthal variations of the albedo were found for neutrons at $E>=2$ MeV, they lessening with decreasing E. The calculated numerical gamma albedo as a function of the source energy (1-6 MeV) and $THETA_0$ are also presented. As $THETA_0$ increases, the gamma albedo increases as well as the "hardness" of the reflected spectrum. The pattern of the angular dependence of the numerical gamma albedo is reminiscent of that for neutrons.

60505 (JEN—512) **Bidimensional neutron transport code Twotran-GG. User's manual and input data. Twotran-Traca version.** Ahnert, C.; Aragones, J.M. (Junta de Energia Nuclear, Madrid (Spain)). 1981. 47p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702387.

A user's manual of the neutron transport code Twotran-Traca is presented; it is a version of the original Twotran-GG from the Los Alamos Laboratory, with some modifications made at J.E.N., Spain. A detailed input data description is given as well as the new modifications developped at J.E.N.

60506 (KFTI—80-6, pp 36-38) **Relativistic particle production in substance.** Truten, V.I.; Fomin, S.P.; Shul'ga, N.F. 1980. (In Russian). Dep. NTIS (US Sales Only).

From Hadron electromagnetic interactions in the resonance energy range; Kharkov, Ukrainian SSR (30 May 1979).

Photoproduction of an electron-positron pair on solitary chain of atoms in crystal is considered. The formulae for the differential cross section of this process are obtained within the framework of the eikonal approximation of quantum electrodynamics. The dependence of the cross section on the chain parameters is found out. The breaking of the coherency of pair production of the chain of atoms is predicted. A physical interpretation of this phenomenon is suggested.

60507 **Electron backscattering from low Z thick absorbers.** Kalef-Ezra, J.; Horowitz, Y.S. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Radiation Physics Lab.); Mack, J.M. (Los Alamos Scientific Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research;* **195**: No. 3, 587-595(15 Apr 1982).

Everhart's approach to electron backscattering from thick absorbers has been modified to include the logarithmic term in the expression for the electron stopping power. Comparison with experimental data for low Z absorbers gives good agreement with the experimentally observed dependence of the electron backscattering coefficient on electron energy. In addition, Monte Carlo calculations are presented for the angular dependence and energy spectrum of backscattered electrons from lithium fluoride and silicon.

6550 Medical Physics

REFER ALSO TO CITATION(S) 60110, 60111, 60221, 60272

60508 (INIS-SU—74, pp 121-126) **Calculation of radiation doses of the electron beam from the LUEh-25 linear accelerator when forming complicated configuration fields.** Afanas'ev, B.P.; Rotenberg, M.Z.; Telesh, L.V.; Shishov, V.A. (Akademiya Meditsinskikh Nauk SSSR, Leningrad. Inst. Onkologii). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Methods of dose calculation of electron beam of the LUE-25 linac are given which allow on the base of a minimum of experimental data with necessary accuracy to find spatial dose distributions. On the base of the given mathematic software the algorithm is developed and the program is written on Fortran permitting to find dose distribution in any plane of the irradiated medium using radiation fields of arbitrary form. Account of curvature of the irradiated medium surface and peculiarities of the anatomic structure of patient is presupposed in the program. The program is intended for ES series computers. Divergence between calculation and experimental distributions in the given range of dose calculation did not exceed 5%.

60509 (INIS-SU—74, pp 227-243) **To the depth dose distribution and strong lacing along depth while polymer irradiation by high-energy electrons.** Khainrikh, Kh.J. (Akademie der Wissenschaften der DDR, Dresden. Zentralinstitut fuer Festkoerperphysik und Werkstofforschung). 1979. Dep. NTIS (US Sales Only).

From 3. all-union conference on applied accelerators; Leningrad, USSR (25 Jun 1979).

Dose distributions of depth along the radiation direction are found for provision of homogeneous distribution of welding during polymer irradiation by electrons of high energy are found experimentally. A formula for mathematical simulation of dose distribution by depth during irradiation by electrons with O.5-3 MeV energy is obtained on the base of experimental and literature data. Two possibilities are shown to exist for approaching most advantageous conditions of radiation during radiation modification of cylindrical objects: usage of electrons with optimal energy and application of multilateral radiation by means of the object rotation or use of quasicircular sweep.

6560 Solid State Physics

60510 (BNL—31665) **Thermoluminescence in systems not subjected to the usual approximations for first- and second-order kinetics.** Levy, P.W. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 12p. (CONF-820864—1). NTIS, PC A02/MF A01. Order Number DE82020744.

From 4. europhysical topical conference on lattice defects in ionic crystals; Dublin, Ireland (30 Aug 1982).

The properties of thermoluminescence (TL) glow curves have been studied in systems, containing one or more glow peaks, not restricted to the assumptions used to derive the usual first and second order glow peak kinetic expressions. If retrapping is negligi-

ble first order glow peaks are obtained whose peak temperature and shape are independent of other factors such as initial trapped charge concentrations. If retrapping occurs, glow peaks are obtained that are, in most cases, only approximated by first or second order kinetics. Also, in these cases the peak temperature, shape, relative intensity and other glow curve characteristics depend strongly on initial trapped charge concentrations, recombination and retrapping cross sections and other factors.

60511 **(LBL—14067) Optical pumping of hot phonons in GaAs.** Collins, C.L.; Yu, P.Y. (Lawrence Berkeley Lab., CA (USA)). 30 Jun 1982. Contract AC03-76SF00098. 4p. (CONF-820937—3). NTIS, PC A02/MF A01. Order Number DE82020519.

From 16. international conference on the physics of semiconductors; Montpellier, France (6 Sep 1982).

Optical pumping of hot LO phonons in GaAs has been studied as a function of the excitation photon frequency. The experimental results are in good agreement with a model calculation which includes both inter- and intra-valley electron-phonon scatterings. The Γ-L and Γ-X intervalley electron-phonon interactions in GaAs have been estimated.

60512 **(SAND—82-1724C) Random walk to and interaction with an impurity.** Richards, P.M. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 19p. (CONF-8206109—1). NTIS, PC A02/MF A01. Order Number DE82019346.

From Symposium on random walks; Washington, DC, USA (28 Jun 1982).

A random walker tagged with a spin may conveniently be studied by small amounts of paramagnetic impurities which significantly affect the spin relaxation at concentrations as low as a few parts per million. Examples are found in nuclear magnetic resonance (NMR) and muon spin rotation (μSR). At low temperature relaxation is determined by the time for the walker to reach an impurity, and thus the impurity acts like a simple trap. Details of the interaction with the impurity are important at higher temperatures, and the relaxation rate is shown to go through a maximum because of this. Special features associated with many returns to the origin, particularly important in one-dimensional walks, and the difference between incoherent (rapidly fluctuating paramagnetic spin) and coherent (stationary paramagnetic spin) returns are discussed.

6561 Superconductivity

REFER ALSO TO CITATION(S) 60673

60513 **(ITF—82-12P) Theory of kinetic phenomena in superconductors under multiquantum absorption of superhigh-frequency electromagnetic field.** Kirichenko, I.K.; Seminozhenko, V.P.; Yatsenko, A.A. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1982. 24p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The paper deals with kinetic and nonequilibrium phenomena in superconductors due to the hf electromagnetic field in the case of multiquantum absorption of the electromagnetic irradiation energy. The effectiveness of various channels of absorption is studied. The conditions of stimulation and suppression of superconductivity in the multiquantum limit are considered. The phonon damping induced by the multiquantum field absorption is calculated.

6570 Theoretical Physics

REFER ALSO TO CITATION(S) 60361

60514 **(DOE/ER/02203—T1) Critical scattering of laser light by fluid films and interfaces. Final progress report, February 1, 1980-January 31, 1982.** Mockler, R.; O'Sullivan, W. (Colorado Univ., Boulder (USA). Dept. of Physics). 1982. Contract AC02-76ER02203. 14p. NTIS, PC A02/MF A01. Order Number DE82020046.

The first intensity autocorrelation studies on thin critical fluid films has been carried out on trapped films of a 2,6 Lutidine + water critical mixture. The scaled Rayleigh linewidth was measured for a range of k xi spanning both the hydrodynamic (k xi << 1) and non-hydrodynamic regimes. Film thicknesses were 13.1, 4.1 and 2.1 μm. These studies have shown that the critical dynamics of fluid films is indistinguishable from that of large samples, even under conditions such that the correlation length is ≧ film thickness. A theory of the lattice dynamics of colloidal particle crystals has been developed and verified by studies of the intensity and intensity autocorrelation of thermal diffuse scattered light measured about Bragg peaks.

60515 **(INP—1069/PL, pp 389-391) Method of calculation of electric fields by point charges method.** Kol'ga, V.V. (Joint Inst. for Nuclear Research, Dubna (USSR)); Trejbal, Z. (Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky). 1980. (In Russian). Dep. NTIS (US Sales Only).

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

The method of calculations of two-dimensional electric fields is described. For these calculations point charges method is used.

60516 **(ITF—82-38P) Distribution functions of the system charged particles - dynamical membrane.** Pilyavskii, A.I. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Apr 1982. 23p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The unary and binary distribution functions of the system electrically charged particles - dynamical membrane are obtained in the self-consistent field approximation. When $E_1 > E_2$, where E_1 and E_2 are the dielectric permeabilities of medium and membrane, respectively, the negative adsorption is shown to hold.

60517 **(UCID—19541) Unification of Yang-Mills theory and supergravity in ten dimensions.** Chapline, G.F.; Manton, N.S. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01. Order Number DE82021350.

We show how to generalize the coupling of n=1 super-Maxwell theory and n=1 supergravity in 10-dimensions to the case of a non-abelian gauge group. We find that the supergravity 2-form potential a/sub μν/ is coupled to the Yang-Mills gauge potential A/sub μ/ via the Chern-Simons 3-form.

6580 Mathematical Physics

60518 **(ITF—80-132P) Metric tensor and Laplacian operator on the group SO(4) in variables - Eulerian angles.** Bystrenko, A.V. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Dec 1980. 12p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

An explicit form of the metric tensor and of the square Laplacian operator corresponding to it on the group SO(4) in variables - the Eulerian angles is found.

70 FUSION ENERGY

7001 Plasma Research

REFER ALSO TO CITATION(S) 59549

60519 **(CEA-tr—2683-2) Use of the electron cyclotron-resonance in plasma diagnostics in open configurations.** Skovoroda, A.A.; Chulkov, G.N. (CEA, 75 - Paris (France)). Sep 1981. 48p. (In French). CEN Saclay, Service de Documentation, 91191 Gif-sur-Yvette Cedex (France).

The resonance on the harmonics of the electron cyclotron frequency in a magnetic field with an extremum was examined. The absorption coefficients of the electromagnetic waves at an electron cyclotron resonance are calculated allowing for the different widening mechanisms for the second harmonic, and the results previously obtained for the first harmonic are analyzed. The absorption of the waves of one resonance in the vicinity of the magnetic field extrema is indicated. The coefficients of absorption does not depend

on the widening mechanism and can be expressed in one single analytical relation. The possibility of using the results obtained for the local measurements of plasma density, the distribution function of electrons and the value of the magnetic field in the adiabatic traps, is examined.

60520 (CONF-811203—Vol.1) **Hot-electron-ring physics.** Uckan, N.A. (ed.). (Oak Ridge National Lab., TN (USA); JAYCOR, San Diego, CA (USA)). Jun 1982. Contract W-7405-ENG-26. 480p. NTIS, PC A21/MF A01. Order Number DE82016600.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Portions of document are illegible.

Separate abstracts were prepared for each of the 24 included papers. The remaining paper appeared previously in ERA. (MOW)

60521 (CONF-811203—Vol.1, pp 23-43) **Hot electron rings: diagnostic review and summary of measurements.** Haste, G.R. (Oak Ridge National Lab., TN). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The hot electron population is a ubiquitous feature of plasmas created by electron cyclotron heating (ECH). This distinctive and unique feature has been studied with an array of diagnostics which have measured various properties. Some of these diagnostics will be reviewed, then the data from a sub-set of them will be used to illustrate the present status of the agreement between the measured and calculated ring power losses.

60522 (CONF-811203—Vol.1, pp 45-80) **Perspective on EBT electron ring theory.** Krall, N.A. (JAYCOR, San Diego, CA). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The hot electron population in ECH plasmas has been analyzed by a wide array of theoretical approaches and techniques. Topics considered have included heating, equilibria, stability, and loss mechanisms, with the degree of sophistication increasing year-by-year. The heating studies have gone from non-relativistic to relativistic, the equilibrium studies have taken increasing account of geometry and adiabaticity, the stability work has begun to recognize the interactive nature of the ring-core problem, and loss studies have included both classical, single particle, and collective processes. A survey of these theoretical topics will review the capabilities and uncertainties of theory in addressing these various topics, including limitations imposed by computing capability, existing analytic theory, and geometry complications and uncertainties. The results of existing theory will be combined to give a conceptual picture of the formation and behavior of the hot electron system in present devices, as well as the changes expected as larger and more reactor-like experiments are brought into operation.

60523 (CONF-811203—Vol.1, pp 83-91) **Curvature-driven instabilities in a hot electron plasma: radial analysis.** Berk, H.L. (Univ. of Texas, Austin); Van Dam, J.W.; Rosenbluth, M.N.; Spong, D.A. Jun 1982. NTIS, PC A21/MF A01. Contract FG05-80ET53088.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The theory of unfavorable curvature-driven instabilities is developed for a plasma interacting with a hot electron ring whose drift frequencies are larger than the growth rates predicted from conventional magnetohydrodynamic theory. A z-pinch model is used to emphasize the radial structure of the problem. Stability criteria are obtained for the five possible modes of instability: the conventional hot electron interchange, a high-frequency hot electron interchange, (at frequencies larger than the ion-cyclotron frequency), a compressional instability, a background pressure-driven interchange, and an interacting pressure-driven interchange.

60524 (CONF-811203—Vol.1, pp 93-116) **Radial structure of instability modes in the EBT hot electron annulus.** Spong, D.A. (Oak Ridge National Lab., TN); Berk, J.W.; Van Dam, J.W.; Rosenbluth, M.N. Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

In the ELMO Bumpy Torus (EBT) device, a hot electron annulus is present near the outside edge of a warm core plasma. Although this provides a localized minimum in B and stabilizes low beta interchange modes of the core plasma, a number of instabilities may still persist in such a configuration. These are: the hot electron interchange mode, the coupling of the ring with compressional Alfven waves of the core plasma, core plasma pressure-driven modes, and instabilities present in the cold surface plasma region outside the ring. The radial structure of such modes is of interest because both instabilities localized to the ring region and those extending into the core plasma can be present in the appropriate parameter regions. Also, studies of the radial structure are useful in assessing the importance of effects such as finite k/sub perpendicular/rho/sub i/ and k/sub perpendicular/ rho/sub H/ that are not included in the present theory. Radially resolved calculations have been done for a z-pinch model which corresponds to a bumpless, azimuthally symmetric version of EBT. A shooting method is employed that matches derivatives of the eigenfunction near the center of the annulus. Relativistic effects are included and a variety of boundary conditions and core and hot electron models have been considered. Results are discussed for the various modes that are present.

60525 (CONF-811203—Vol.1, pp 117-142) **Stability of low frequency modes in a hot electron Bumpy Torus.** Tsang, K.T.; Catto, P.J. (Science Applications, Inc., Boulder, CO). Jun 1982. NTIS, PC A21/MF A01. Contract AC03-76ET53057.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The system of equations appropriate for describing low frequency modes (OMEGA < OMEGA/sub i/) in general geometry for a three-species plasma is derived. The derivation employs an eikonal ansatz and for simplicity assumes Maxwellian unperturbed distribution functions, but permits arbitrary beta and asymmetry. The full system of equations includes ballooning, interchange and compressional Alfven modes. As examples, two limits of the general results are employed to study EBT stability. The first example, a local analysis of the high phase velocity ring model, leads to analytic estimates of stability boundaries due to interchange and compressional Alfven modes, which agree with numerical solutions. In the second example, the hot electrons are treated as a trapped species and, in the limit of pure magnetic perturbations, the magnetic trapped particle mode is recovered.

60526 (CONF-811203—Vol.1, pp 143) **Kinetic theory of EBT stability.** Cheng, C.Z. (Univ. of Texas, Austin). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

60527 (CONF-811203—Vol.1, pp 145-165) **Stabilization of high beta plasma instability with ech hot electron annulus in the symmetric mirror.** Hiroe, S. (Oak Ridge National Lab., TN); Kunibe, T.; Akiyama, H.; Inutake, M. Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

A hot electron annulus has been observed to decrease the fluctuation level for a high beta plasma in a symmetric mirror. The fluctuation is identified as the resistive drift wave, which is enhanced by the unfavorable curvature at the plasma edge. When the annulus is present, not only is the drift mode suppressed, but also the amplitude of the disruption caused by the drift mode decreases. The amplitudes of the drift mode and the disruption both decrease as the microwave power is increased.

60528 (CONF-811203—Vol.1, pp 167-180) **Experimental hot-to-warm electron density ratio for instability threshold in the ELMO Bumpy Torus.** Hiroe, S.; Berry, L.A.; Colchin, R.J.; Glowienka, J.C.; Haste, G.R.; Hillis, D.L.; Uckan, T. (Oak Ridge National Lab., TN). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The hot-to-warm electron density ratio is determined for the onset of instabilities that spontaneously grow in the region of large stored energy in the ELMO Bumpy Torus (EBT). When this ratio exceeds ~ 0.5, the instability becomes conspicuous as an oscillation on the microwave interferometer signal. When the microwave power and ambient pressure are varied, the ratio remains constant in spite of changes in the density, temperature, and beta value. The stable region in a β diagram increases when the microwave power increases.

60529 (CONF-811203—Vol.1, pp 181-189) **Stabilization of the flute instability by a dc electric field in toroidal plasmas.** Alexeff, I. (Univ. of Tennessee, Knoxville). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The absence of the flute instability in the NASA Lewis Bumpy Torus and the ELMO Bumpy Torus at Oak Ridge is investigated by classical incompressible MHD. We find that radial electric fields produce rapid ExB precession about the minor perimeter. This precessional velocity is sheared with respect to distance along the Z-direction of the torus. We demonstrate by means of a simple model that this shear velocity reduces the flute growth rate to a value consistent with that of classical resistive drift, or in plasma terminology, classical diffusion.

60530 (CONF-811203—Vol.1, pp 191-212) **Necessary and sufficient criteria for the stability of a hot particle ring-plasma system.** Antonsen, T.M. Jr.; Lee, Y.C. (Univ. of Maryland, College Park). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The stability of a collisionless plasma with a population of energetic particles is analyzed. All species are assumed to obey the guiding center equations of motion, and thus, finite gyroradius and finite cyclotron frequency effects are not considered. The equilibrium magnetic field configuration is allowed to be arbitrary, and both equilibrium and perturbed electrostatic fields are included. A quadratic form is derived from the equations of motion and stability criteria are deduced from this form with the aid of Nyquist's technique. No apriori assumption concerning the constancy of the third adiabatic invariant is made. Nevertheless, in the case in which the drifts of the energetic particles are favorable (i.e. δ F/δ ϵ vertical bar/sub J/ < 0) marginal stability occurs at zero frequency and the quadratic form gives necessary and sufficient conditions for stability. The relationship of the instability thresholds predicted by the variational principle to those predicted by a modal analysis will be examined, and possible discrepancies between the two theories will be clarified.

60531 (CONF-811203—Vol.1, pp 213-235) **Simulation studies on stability and β limits of EBT.** Ohsawa, Y.; Dawson, J.M. (Univ. of California, Los Angeles). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Stability and β limits of a slab model for an EBT-like configuration is studied by using a 2-1/2 dimensional fully electromagnetic code. When there are no hot electrons in our simulation, the low frequency interchange mode grows; its growth rate agrees well with MHD theory. When we put in a hot electron layer with appropriate conditions, the growth of the interchange mode can be suppressed. However, the results are sensitive to the position of hog electrons. No evidence for excitation of magneto acoustic instabilities has been seen.

60532 (CONF-811203—Vol.1, pp 237-246) **Parametric decay instabilities in ECR heated plasmas.** Porkolab, M. (Lawrence Livermore National Lab., CA). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The possibility of parametric excitation of electron Bernstein waves and low frequency ion oscillations during ECR heating at omega/sub o/ $\simeq$ 1 omega/sub ce/, 1 = 1,2 is examined. In particular, the thresholds for such instabilities are calculated. It is found that Bernstein waves and lower hybrid quasi-modes have relatively low homogeneous where T/sub e/ $\simeq$ T/sub i/. Thus, these processes may lead to nonlinear absorption and/or scattering of the incident pump wave. The resulting Bernstein waves may lead to either more effective heating (especially during the start-up phase) or to loss of microwave energy if the decay waves propagate out of the system before their energy is absorbed by particles. While at omega/sub o/ = omega/sub UH/ the threshold is reduced due to the WKB enhancement of the pump wave, (and this instability may be important in tokamaks) in EBT's and tandem mirrors the instability at omega /sub o/ $\geqq$ 2 omega/sub ce/ may be important. The instability may persist even if omega > 2 omega/sub ce/ and this may be the case during finite beta depression of the magnetic field in which case the decay waves may be trapped in the local magnetic well so that convective losses are minimized. The excited fluctuations may lead to additional scattering of the ring electrons and the incident microwave fields. Application of these calculations to ECR heating of tokamaks, tandem mirrors, and EBT's will be examined.

60533 (CONF-811203—Vol.1, pp 247-277) **Whistler instability at relativistic energies.** Gladd, N.T. (JAYCOR, San Diego, CA). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The whistler instability, driven by the temperature anisotropy T/sub perpendicular/ > T/sub parallel/, represents a potentially serious drain on the energy content of hot electron rings. While indirect measurements suggest that scattering losses in EBT are classical, this instability has been directly observed in other ECH heated plasmas. The traditional reason given for the absence of dramatic effects in EBT due to this instability is that the relativistic broadening of the whistler wave resonance with ring electrons stabilizes the instability. While the idea is very plausible, its firm establishment requires the accurate solution of a formidable dispersion equation. We report here the results of a detailed numerical analysis of the dispersion equation for the relativistic whistler. In brief, we find that the relativistic broadening acts to reduce the growth rate of the whistler but does not completely suppress the mode. Although the whistler is not stabilized, the relativistic reduction of the growth rate can readily result in situations where the effects of parallel electron dynamics (bounce motion) are significant over times of interest. Parameterizing the ring by its pressure (β/sub perpendicular/), its anisotropy (T/sub perpendicular//T/sub parallel/) and the relative fraction of ring electrons (Δ), we calculate how relativistic (T/sub perpendicular//mc^2) the ring must be in order that the whistler growth rate be reduced to a value on the order of the bounce frequency.

60534 (CONF-811203—Vol.1, pp 289-314) **Stability of anisotropic relativistic hot electron plasma in the ELMO Bumpy Torus.** Nguyen, K.T. (Univ. of Michigan, Ann Arbor); Kammash, T.; Kashuba, R.J. Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The stability of an EBT plasma with an anisotropic, relativistic hot electron component is examined using the kinetic approach in a slab geometry model. An anisotropic equilibrium distribution function is constructed for the hot electrons by assuming that <P^2/sub z/> << <P^2/sub perpendicular/>, mc^2 where P/sub z/ and P/sub perpendicular/ are respectively the parallel and perpendicular momenta, and mc^2 is the rest mass energy. We find that a significant enhancement in the stability of the flute interchange mode occurs as a result of relativity. For typical EBT parameters the ion beta, β/sub i/ increases by about 50% as a result of increasing the hot electron energy from about 5 keV to about 5 MeV. For energies beyond the rest mass energy the increase in β/sub i/ is not as dramatic. We also find that P/sub i/L/sub n/ where P/sub n/ is the ion gyroradius, and L/sub n/ is the density gradient scale length, is a critical parameter for instabilities arising from coupling between the interchange mode, the hot electron drift mode and the compressional Alfven mode.

60535 (CONF-811203—Vol.1, pp 317-337) **Hard x-ray measurements of the hot electron rings in EBT-S.** Hillis, D.L. (Oak Ridge National Lab., TN). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

A thorough understanding of the hot electron rings in ELMO Bumpy Torus-Scale (EBT-S) is essential to the bumpy torus concept of plasma production, since the rings provide bulk plasma stability. The hot electrons are produced via electron cyclotron resonant heating using a 28-GHz cw gyrotron, which has operated up to power levels of 200 kW. The parameters of the energetic electron rings are studied via hard x-ray measurement techniques and with diamagnetic pickup coils. The hard x-ray measurements have used collimated NaI(Tl) detectors to determine the electron temperature T/sub e/ and electron density n/sub e/ for the hot electron annulus. Typical values of T/sub e/ are 400 to 500 keV and of n/sub e/ 2-5 x 10^{11} cm^{-3}. The total stored energy of a single energetic electron ring as measured by diamagnetic pickup loops approaches $\sim$ 40 J and is in good agreement with that deduced from hard x-ray measurements. By combining the experimental measurements from hard x-rays and the diamagnetic loops, an estimate can be obtained for the volume of a single hot electron ring. The ring volume is determined to be $\sim$ 2.2 litres, and this volume remains approximately constant over the T-mode operating regime. Finally, the power in the electrons scattered out of the ring is measured indirectly by measuringthe x-ray radiation produced when those electrons strike the chamber walls. The variation of this radiation with increasing microwave power levels is found to be consistent with classical scattering estimates.

60536 (CONF-811203—Vol.1, pp 339-360) **Interaction of microwave with hot electron ring in Nagoya Bumpy TORUS.** Tanka, M.; Hosokawa, M.; Fujiwara, M.; Ikegami, H. (Nagoya Univ., Japan). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Decay of hot electron rings is experimentally studied on Nagoya Bumpy TORUS (NBT) plasmas with the hot electron temperature of 100 keV and density of 10^{11} cm^{-3} in the background cold plasma density of 5 x 10^{11} cm^{-3}. With hydrogen plasmas the decay of the ring is observed to be governed by the Coulomb drag, if we take the contribution from electrons in the neutral atomic shell, as well as plasma electrons. It is also observed that the ring intensity levels off as the microwave power increases. The saturation in the ring beta can be attributed to a decrease in the cyclotron damping when the hot electron density increases beyond a critical value, which may determine the maximum ring β.

60537 (CONF-811203—Vol.1, pp 361-371) **Ring temperature scaling.** Uckan, N.A. (Oak Ridge National Lab., TN). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

During the last two decades the production of high-beta, hot electron plasmas with electron cyclotron heating (ECH) has been amply demonstrated in open and closed geometries. A wide variety of conditions was present in these experiments with a factor of 2 change in device dimensions and more than an order of magnitude change in magnetic fields ($\sim$ 1-10kG), ECH frequencies ($\sim$ 6-55 GHz), and hot electron temperatures ($\sim$ 50-1200 keV). An analysis of the data from all the experiments that used single ECH frequency indicates that the hot electron temperatures do increase with magnetic field strength (or, equivalently, ECH frequency) and scale length. In particular, they all obey rho/L $\simeq$ constant ($\sim$ 5-6 x 10^{-3}) scaling, where rho and L are the hot electron gyroradius (relativistic) and the magnetic field scale length, respectively. This is roughly the value at which conservation of the adiabatic invariant μ begins to break down and suggests that the hot electron temperatures are probably limited by nonadiabatic particle behavior. Results, primarily from hot electron ring experiments (ELMO, EBT, NBT, etc.), are discussed, and projections for future experiments are given. It is shown that although in all previous experiments the ring temperature is determined by the rho/L criterion EBT-P will be the first experiment unconstrained by this limit.

60538 (CONF-811203—Vol.1, pp 373-392) **Parametric study of the relativistic electron ring.** Hamasaki, S.; Krall, N.A.; Sperling, J.L. (JAYCOR, San Diego, CA). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

In the JAYCOR relativistic ring model, appropriate moments of the relativistic electron kinetic equation are used to determine the steady-state ring parameters by equating the microwave heating and the losses associated with various processes including collisions, synchrotron radiation, loss of adiabaticity, and microinstabilities. The model has the flexibility to permit the evaluation of the role that various combinations of loss processes play on steady-state ring parameters and the energy balance. For example, it is demonstrated that collisions and synchrotron radiation alone cannot account for the experimental ring temperatures in present bumpy tori, but the combination of collisions, synchrotron radiation, nonadiabaticity, and whistler turbulence provides a better comparison with present experiments. The ring model has been applied to larger projected bumpy tori (e.g., EBT-P and EBT-R). Collisions and synchrotron radiation are shown to play a relatively more significant role in the ring dynamics in these larger bumpy tori than in present-day smaller devices.

60539 (CONF-811203—Vol.1, pp 393-408) **Prospects for control of ELMO rings.** Guest, G.E.; Dandl, R.A. (AMPC, Inc., Encinitas, CA). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

A conceptual approach to controlling some important properties of hot-electron plasmas created by electron cyclotron heating, particularly the high-beta ELMO Rings is described. The approach to be considered is based on the anticipation that a significant number of collisionless, warm electrons can be accumulated in limit cycles arising from one of several possible coherent interactions with the ECH fields. If stochastic behavior is restored to these electrons, they can be heated to the relativistic energies characteristic of ELMO Rings. The number of warm electrons that can be manipulated for control purposes can also be affected by choice of system parameters.

60540 (CONF-811203—Vol.1, pp 409-424) **Nonadiabaticity and high energy particle orbits in EBT.** Owen, L.W.; Deleanu, L.E.; Hedrick, C.L. (Oak Ridge National Lab., TN). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The scaling of hot electron ring temperatures in ELMO Bumpy Torus (EBT) and mirror experiments and results of recent ICH experiments on EBT-S suggest the scaling law rho/L $\approx$ 0.05, where rho is the gyroradius and L is the magnetic scale length. This is roughly the value at which conservation of the adiabatic invariant μ begins to break down. The behavior of μ(tau) and particle drift orbits are obtained by numerical integration of the equations of motion. In the absence of electric fields it is shown that nonconservation of μ for rho/L $\approx$ 0.05 is so weak that it has little effect on drift orbits and affects particle losses only through enhanced pitch scattering. Only for particle energies of about five times the temperature do rapid direct losses, due to magnetic moment jumps, start to become important.

60541 (CONF-811203—Vol.1, pp 425-439) **Nonadiabatic motion of hot annulus electrons in EBT-I and EBT-P.** Juhala, R.E. (McDonnell Douglas Astronautics Co., St. Louis, MO); Prelas, M.A.; Wallace, C.B. Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Single particle motion in a magnetically confined plasma is usually taken to be adiabatic, i.e., rho/sub L/ DELTA B/B $<<$ 1, where rho/sub L/ is the gyroradius. In this case the magnetic moment ($\gamma\mu$ = P/sub perpendicular to/^{2}/2mB) is a constant of the motion. Experimental and theoretical studies have shown that adiabatic motion is obtained for rho/sub L//L/sub m/ $\leq$ 0.4 (where L/sub m/ denotes the magnetic scale length). In an EBT device the electron annulus diamagnetism can be expected to modify the mag-

netic scale lengths, and it appears that the ring temperature may be limited by non-adiabatic losses of electrons from the mirror trap in the present EBT-I experiment. This phenomenon has been studied by tracking single particles in an axisymmetric mirror with rigid ring magnetic fields derived from an ad hoc vector potential so that $\Delta B = 0$ is satisfied. The lack of toroidal curvature is of no consequence since the poloidal magnetic scale length is greater than either the axial or radial scale lengths. The ring field width and thickness are set to be consistent with measured values on EBT-I, approximately 10 cm and 3 cm, respectively. The strength of the diamagnetism is appropriate for a ring beta of 25 to 30%. For these nominal values a comparison of $\Delta\mu/\mu$ is made with and without the annulus field present. The results of a comparison of single particle motion in the vacuum and annulus fields are presented.

60542 (CONF-811203—Vol.1, pp 441-461) **Heating of energetic electrons and ELMO ring formation in symmetric mirror facility.** Quon, B.H. (TRW, Inc., Redondo Beach, CA); Dandl, R.A.; Lazar, N.H.; Wuerker, R.F. Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The spatial structure of the high beta, hot-electron ECH plasma, (ELMO Ring), has been studied by using a Hall probe array diagnostic system which measures the diamagnetic field of the hot electron plasma in a large number of spatial locations. The steady state pressure profile obtained using a two-gaussian geometric model that best fits the measurements is found to peak at the mirror midplane near the vacuum field second harmonic resonant point. The radial width of the ring is typically 4 to 7 cm, and the axial length extends significantly beyond the second harmonic resonance zone of the total magnetic field. The radial thickness and the Ring beta are increased by multiple frequency ECH. The electron ring is observed to evolve from a sloshing-like turning point distribution which was observed in the early times following a microwave turnon, demonstrating stochastic processes involved in ELMO Ring formation.

60543 (CONF-811203—Vol.1, pp 463-470) **Spatial structure of the SM-1 symmetric mirror hot electron ring using diamagnetic measurements.** Lao, L.L. (TRW DSSG, Redondo Beach, CA); Quon, B.H.; Dandl, R.A.; Lazar, N.H. Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The spatial structure of the hot electron ring in the SM-1 symmetric mirror device is deduced by correlating the diamagnetic measurements with the values predicted using anisotropic, guiding-center multi-fluid equilibrium models. These models are defined by a small enough number of parameters to permit efficient fitting of empirical data using linear regression methods. The hot electrons are found to consist of two components. The first one has the usual Elmo ring structure in the vicinity of the second harmonic resonant surfaces and the second one extends up to the fundamental resonant surfaces and contains a sizeable fraction of the total stored energy.

60544 **(CONF-811203—Vol.2) Hot-electron-ring physics.** Uckan, N.A. (ed.). (Oak Ridge National Lab., TN (USA); JAYCOR, San Diego, CA (USA)). Jun 1982. Contract W-7405-ENG-26. 343p. NTIS, PC A15/MF A01. Order Number DE82016599.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Separate abstracts were prepared for each of the 16 included papers. (MOW)

60545 (CONF-811203—Vol.2, pp 487-504) **Ray tracing studies of microwave heating of the annulus in EBT devices.** Batchelor, D.B. (Oak Ridge National Lab., TN); Goldfinger, R.C.; Weitzner, H. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Electron cyclotron absorption of ordinary and extraordinary waves by the combined core-plasma and relativistic annuli have been studied numerically. A fully relativistic damping package has been developed for the RAYS geometrical optics code, which allows the contribution from an arbitrary number of cyclotron harmonics to be included. The rays are traced in finite beta bumpy cylinder plasma equilibria which is obtained from the ORNL two-dimensional (2-D) equilibrium code. These results for direct, single-pass absorption are combined with results from a statistical model for the deposition of multiply reflected and mode converted waves to obtain estimates of the power deposited in the core, surface, and annulus plasma components. Self-consistent estimates of the annulus power losses for EBT-I, EBT-S, and EBT-P are obtained using the same ring equilibrium model.

60546 (CONF-811203—Vol.2, pp 519-529) **Multiple frequency ECH (MFECH) in SM-1 and STM-1.** Lazar, N. (TRW, Inc., Redondo Beach, CA); Barter, J.; Dandl, R.; DiVergilio, W.; Quon, B.; Wuerker, R. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Plasma properties were studied in a simple mirror (SM-1) and a five-cell axisymmetric tandem mirror (STM-1) using multiple frequency ECH. The cold plasma properties depend predominantly on total power but the efficiency for producing the diamagnetic ring plasma depends critically on heating with multiple frequencies. The effects of frequency separation of the heating sources will be demonstrated. Noise fluctuations in the axial current are suppressed with increasing ring-β, but the observed frequency spectrum are not well understood. Annulus β in the multiple mirror is also dependent on MFECH. Plans for and experiments in the new facility will be described.

60547 (CONF-811203—Vol.2, pp 531-544) **Simulation of electron cyclotron resonance heating with multiple frequencies in mirror geometry.** Samec, T.K. (TRW, Inc., Redondo Beach, CA); Hauss, B.I.; Guest, G.E. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Monte Carlo simulations of multiple frequency electron cyclotron resonance heating have been performed. The observed differences with single frequency heating may provide explanations for the experimentally observed improvements in plasma parameters which result from multiple frequency heating.

60548 (CONF-811203—Vol.2, pp 561-582) **Theory of multifrequency ECRH.** Howard, J.E. (Univ. of California, Berkeley); Lieberman, M.A.; Lichtenberg, A.J.; Cohen, R.H. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Significant enhancement of ECRH has been demonstrated experimentally by dividing the heating power among several closely-spaced frequencies. This effect may possibly be explained as an increase in the adiabatic barrier via destruction of isolating KAM curves. We have investigated this possibility for two frequencies both analytically and numerically by means of area-preserving mappings. The basic enhancement mechanism of interspersing two sets of phase space islands which can be made to overlap, has been treated in detail for the Fermi acceleration model of particle heating. In general, the ERCH problem requires a four-dimensional phase space, owing to changes in V/sub parallel to/ between the resonance layers, but reduces to a two-dimensional mapping when the two frequencies are sufficiently close. Linear and nonlinear stability limits are derived and confirmed numerically. Constraints on Δomega/omega are obtained for optimal island spacing and validity of the mathematical models. Implications for the design of two-frequency experiments are discussed.

60549 (CONF-811203—Vol.2, pp 597-608) **Enchancement of EBT ring parameters during ion cyclotron heating.** Baity, F.W. (Oak Ridge National Lab., TN); Glowienka, J.C.; Hillis, D.L.; Owens, T.L. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Significant enhancement of the relativistic electron ring parameters during ion cyclotron heating (ICH) on EBT-S has been

observed. Even with moderate ICH power absorbed by the plasma (≦ 10 kW), the ring temperature increased by as much as 40%, and the ring density doubled. The ICH power was applied to a single one-third turn antenna located midway between two toroidal field magnet coils; however, under certain conditions, the rings were enhanced all around the torus. (At the same time, the core plasma ion energy was strongly increased, with little effect on other core parameters). The mechanism responsible for the ring enhancement is not understood.

60550 (CONF-811203—Vol.2, pp 609-632) **Non-standard heating experiments in EBT.** Glowienka, J.C. (Oak Ridge National Lab., TN); Davis, W.A.; Hillis, D.L.; Uckan, T.; Bieniosek, F.M.; Solensten, L. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Reported here are the results of two nonstandard heating experiments. In one, the fundamental ECH resonance either at 10.6 or 18 GHz was placed at the usual ring position in an attempt to generate rings solely with fundamental heating (Fundamental Resonance configuration - FR). In a second experiment, and attempt was made to heat the ring and core separately by forming the ring as above with 10.6 GHz and then heating the core with the fundamental and second harmonic of 28 GHz (SCRATCH). In both cases, the hot electron annuli were formed and stabilized the core plasma as in the SR experiments. In FR, the ring is formed at the second harmonic and no significant potential structures were found. In SCRATCH, either a potential well or a potential hill could be formed. In both heating regimes, significant ion heating above that found in standard heating experiments was found.

60551 (CONF-811203—Vol.2, pp 635-655) **Synchrotron emission measurements from the hot electron rings in EBT.** Wilgen, J.; Uckan, T. (Oak Ridge National Lab., TN). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Preliminary measurements of synchrotron emission from the hot electron rings of EBT have been carried out. The purpose of the experiments is to acquire information about the intensity of the radiation as a diagnostic for estimating rig parameters, such as ring density, temperature, and physical size. In the experiment, a conventional, fast-sweeping, superheterodyne receiver was used, and the measurements were performed in the frequency range of 80 to 110 GHz. In EBT, the hot electron rings are produced by ECH, and their location is at the second harmonic resonance. The microwave heating frequencies are 18 and 28 GHz, the typical hard x-ray ring temperatures are 150 and 500 keV, and the electron densities are 2×10^{11} and 3×10^{11} cm^{-3}, respectively, for EBT-I and EBT-S. Considering the relativistic effects, the estimated fundamental emission frequency is about 7 GHz for both EBT-I and EBT-S.

60552 (CONF-811203—Vol.2, pp 657-687) **Synchrotron emission from the ring electrons in EBT.** Uckan, T.; Uckan, N.A. (Oak Ridge National Lab., TN). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The energy spectrum of the synchrotron radiation emitted by the relativistic ring electrons in ELMO Bumpy Torus (EBT) has been calculated for various classes of isotropic and anisotropic ring electron distribution functions. Calculations have been carried out for present (EBT-I/S) and planned (EBT-P) experiments. The ring temperatures in EBT-I and EBT-S are ~ 200 and ~ 500 keV, respectively. The projected ring temperature in EBT-P is ~ 1000-1500 keV. The calculations indicate that the radiation is predominantly in higher harmonics ($l \geqq \gamma^3/2$) and the radiation spectrum monotonically decreases and becomes almost flat at high frequencies, as observed in the experiments. With increasing temperature and anisotropy, the total emission increases, the slope of the spectrum decreases, and the peak of the spectrum moves to higher frequency. The ratio of the extraordinary wave intensity to ordinary wave intensity decreases with temperature but increases with anisotropy. Calculated spectra and relative intensity levels of EBT-I and EBT-S are found to be in reasonable agreement with the experimental measurements. Both measurements and calculations show that synchrotron losses are low in EBT-I and EBT-S.

60553 (CONF-811203—Vol.2, pp 689-699) **Electromagnetic interactions of non-Maxwellian plasmas.** Tamor, S. (Science Applications, Inc., La Jolla, CA). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The velocity distribution function of the EBT ring electrons is expected to be highly non-Maxwellian, and an investigation of the consequence of this fact with respect to emission, absorption, and transport of radiation is underway. A study of the emission of synchrotron radiation suggests that the angular distribution of the radiation may be a useful diagnostic for studying the anisotropy of the underlying plasma. We are also interested in the absorptive properties of the plasma and have recently developed a computer code which calculates the absorption coefficient for a model class of non-Maxwellian distributions. The first application has been to calculating the absorption coefficients at the first and second harmonics, and initial results indicate that anisotropy tends to increase the absorption coefficient of the extraordinary mode. Further studies both at higher frequencies, and for non-Maxwellian energy distributions will be carried out.

60554 (CONF-811203—Vol.2, pp 701-715) **Analytic expressions for synchrotron radiation from EBT.** Winske, D.; Boyd, D.A.; Tsakiris, G.D. (Univ. of Maryland, College Park). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Analytic expressions for the power emitted per unit volume per solid angle per unit frequency at perpendicular propagation as synchrotron radiation from a relativistic loss-cone distribution of electrons are presented. These expressions are useful for understanding how the radiation scales and for inferring properties of the plasma from measurements of the radiation. As an example, it is shown that the temperature and loss-cone angle of the electron distribution in the EBT ring can be determined in a straightforward fashion from the ratio of radiation in the two polarizations at two frequencies. This method will be used in a forthcoming University of Maryland diagnostic experiment on EBT-S, which is described in some detail.

60555 (CONF-811203—Vol.2, pp 717) **Electron synchrotron emission from the EBT ring plasma.** Celata, C.M. (Dartmouth Coll., Hanover, NH). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

60556 (CONF-811203—Vol.2, pp 721-738) **Ion ring scaling studies for an EBT reactor.** Gordinier, M.R.; Kashuba, R.J. (McDonnell Douglas Astronautics Co., St. Louis, MO). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The Nelson-Lee-Van Dam ring-core stability criteria constrains the maximum core beta at the annulus to a value proportional to the ratio of the ring thickness to the radius of curvature. Since a substantial core beta is desireable for an economic reactor, thick rings may be necessary if beta is to be increased consistent with the ring-core stability relation. Therefore, the power balance of large gyroradii ion rings in an EBT reactor is investigated. Previous calculations have demonstrated that charge-exchange is the dominant energy loss mechanism for ion rings. A model for the ion rings has been coupled to SPUDNUT, a neutral transport code, in order to evaluate the total ring power loss for a variety of ring radii, thicknesses, temperatures, and neutral densities. Results will be presented indicating that a broad window exists in which the goal of ring thickness, acceptable power losses, and sufficient ring beta can be simultaneously achieved.

60557 (CONF-811203—Vol.2, pp 739-760) **Ring power balance observing plasma stability constraints.** Campbell, R.B. (TRW, Inc., Redondo Beach, CA); Logan, B.G. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Ring power balance is performed for an E-ring stabilized tandem mirror reactor, taking into account constraints imposed by plasma stability. The two most important criteria are the stability of the core interchange and hot electron interchange modes. The former determines the ring thickness, the latter determines the minimum hot electron temperature; both quantities are important for power balance. The combination of the hot electron interchange constraint and the fact that the barrier density is low places the operating point on the synchrotron dominated branch of power balance. The reference case considered here requires a reasonable 34 MW of heating power deposited in the rings. We also have examined the sensitivity of the required ring power on uncertainties in the numerical coefficients of the stability constraints. We have found that the heating power is strongly affected.

60558 (CONF-811203—Vol.2, pp 761-791) **Numerical study of Vlasov equilibrium for bumpy cylinder plasma with hot electron rings.** Watanabe, T.; Hamamatsu, K.; Van Dam, J.W.; Nishikawa, K. (Hiroshima Univ., Japan). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

Equilibrium for an axisymmetric periodic bumpy cylinder plasma with hot electron rings is studied numerically. Each plasma species is described by a Vlasov distribution function whose functional dependence on the single-particle energy, magnetic moment, and angular momentum is appropriately specified so as to include the effects of temperature anisotropy, mirror trapping, and finite gyroradius. The equilibrium magnetic field, together with the electrostatic potential, is then self-consistently obtained by numerically solving the Poisson and Ampere equations as a nonlinear boundary value problem.

60559 (CONF-811203—Vol.2, pp 793-814) **Sensitivity of heavy ion beam probe to hot electrons in EBT.** Bieniosek, F.M. (McDonnell Douglas Astronautics Co., St. Louis, MO); Connor, K.A. Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

This paper discusses a method of studying the radial position of locally heated hot electrons in EBT. The heavy ion beam probe on EBT is sensitive to all three electron components - those of the cold surface plasma, the warm core plasma, and the hot electron ring. The total detected signal is proportional to the local electron density at the point of ionization and to the beam ionization rate, which is in turn a function of the local electron temperature. Use of the total detected signal enables qualitative profile measurements of this product known as nf(T/sub e/). The function f(T/sub e/) peaks at several hundred eV, and falls slowly for electron temperatures up to several hundred keV. Especially useful in studies of the hot electrons are the triply ionized $Cs^{3}+$ ionization products. Observations of $Cs^{3}+$ signals with and without 18 GHz microwave power input to the beam probe cavity in EBT-I show a sensitivity to a locally heated hot electron component. Measurements of this component show that it is spatially localized near the 18 GHz second harmonic resonance surface. The hot component is observed at both the upper and lower edges of the plasma and its radial position is observed to vary as the toroidal magnetic field is changed.

60560 (CONF-811203—Vol.2, pp 829-832) **MHD stability of tandem mirrors.** Poulsen, P.; Molvik, A.; Shearer, J. (Lawrence Livermore National Lab., CA). Jun 1982. NTIS, PC A15/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

The TMX-Upgrade experiment was described, and the manner in which various plasma parameters could be affected was discussed. The initial analysis of the MHD stability of the tandem mirror was also discussed, with emphasis on the negative tandem configuration.

60561 **(DOE/ET/51013—49) D-D neutron energy-spectra measurements in Alcator C.** Pappas, D.S.; Wysocki, F.J.; Furnstahl, R.J. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). Aug 1982. Contract AC02-78ET51013. 11p. (PFC/RR—82-14). NTIS, PC A02/MF A01. Order Number DE82021688.

Measurements of energy spectra of neutrons produced during high density (anti n/sub e/ $> 2 \times 10^{14}$ cm^{-3}) deuterium discharges have been performed using a proton-recoil (NE 213) spectrometer. A two foot section of light pipe (coupling the scintillator and photomultiplier) was used to extend the scintillator into a diagnostic viewing port to maximize the neutron detection efficiency while not imposing excessive magnetic shielding requirements. A derivative unfolding technique was used to deduce the energy spectra. The results showed a well defined peak at 2.5 MeV which was consistent with earlier neutron flux measurements on Alcator C that indicated the neutrons were of thermonuclear origin.

60562 **(DOE/ET/51013—51) High-energy-ion depletion in the charge exchange spectrum of Alcator C.** Schissel, D.P. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). 6 Aug 1982. Contract AC02-78ET51013. 80p. NTIS, PC A05/MF A01. Order Number DE82021690.

Thesis. Portions of document are illegible.

A three-dimensional, guiding center, Monte Carlo code is developed to study ion orbits in Alcator C. The highly peaked ripple of the magnetic field of Alcator is represented by an analytical expression for the vector potential. The analytical ripple field is compared to the resulting magnetic field generated by a current model of the toroidal plates; agreement is excellent. Ion-Ion scattering is simulated by a pitch angle and an energy scattering operator. The equations of motion are integrated with a variable time step, extrapolating integrator. The code produces collisionless banana and ripple trapped loss cones which agree well with present theory. Global energy distributions have been calculated and show a slight depletion above 8.5 keV. Particles which are ripple trapped and lost are at energies below where depletion is observed. It is found that ions pitch angle scatter less as energy is increased. The result is that, when viewed in velocity space, ions form probability lobes the shape of mouse ears which are fat near the thermal energy. Therefore, particles enter the loss cone at low energies near the bottom of the core. Recommendations for future work include improving the analytic model of the ripple field, testing the effect of del . B not equal to 0 on ion orbits, and improving the efficiency of the code by either using a spline fit for the magnetic fields or by creating a vectorized Monte Carlo code.

60563 **(DOE/ET/53051—43) High-beta neoclassical current and stability experiments.** Callen, J.D.; Dexter, R.N.; Fortgang, C.M. (Wisconsin Univ., Madison (USA)). Jul 1982. Contract AC02-76ET53051. 14p. (CONF-820930—7). NTIS, PC A02/MF A01. Order Number DE82020261.

From 9. international conference on plasma physics and controlled nulcear fusion research; Baltimore, MD, USA (1 Sep 1982).

Equilibrium neoclassical plasma currents and plasma stability at high values of beta have been studied in the Levitated Toroidal Octupole. In a collisionality regime at the border between the banana and plateau regimes, the bootstrap and Pfirsch-Schlueter currents have for the first time been experimentally observed in agreement with neoclassical theory. Also, stable plasmas have been produced with extremely high beta values (2.5 times the MHD ballooning instability beta limit) and compared with the results of a kinetic stability calculation, implicating finite ion gyroradius effects as a possible cause for the observed stability. To augment both the bootstrap current and stability studies, four megawatts of ion cyclotron resonance heating power are being optimized.

60564 **(GA-A—16750) Simple on-line indication of the Doublet III shaping parameters from magnetic measurements.** Shinya, K.; Yokomizo, H. (General Atomic Co., San Diego, CA (USA); Japan Atomic Energy Research Inst., Tokyo). Aug 1982. Contract AT03-80SF11512. 45p. NTIS, PC A03/MF A01. Order Number DE82021978.

A flux loop method has been developed to indicate the elongation and triangularity of a plasma cross section immediately after

a shot. The method incorporates the appropriate flux loop signals and produces the value of the flux loop elongation and triangularity. Suitable flux loop combinations were selected according ESTHER code prediction; their quantitative correspondence was decided by the fitting of the experimental data. The shaping parameter indication by this method shows good agreement with the equilibrium analysis. This method can be incorporated into the feedback control system of the plasma cross section.

60565 **(INIS-mf—7069) About the connection between neutron production and instabilities in a plasma focus.** Rueckle, B. (Stuttgart Univ. (TH) (Germany, F.R.). Fakultaet Elektrotechnik). 9 Feb 1981. 101p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780654.

Thesis.

In the advanced phases of discharge, plasma focus devices emit intense neutron and X radiation. In order to gain knowledge about the processes leading to neutron production in plasma, a number of diagnostic methods with high spatial and time resolution must be applied simultaneously, the most important method being newly developed 10-channel interferometry, yielding plasma density. Additional methods were: measurement of time-dependent plasma current with magnetic probes, of time-dependent X-ray and neutron emission by scintillator-multiplier units, and time-of-flight spectrometry of neutrons, yielding the following main results: neutron and X-ray emission are caused by m = 0 instabilities in the late phases of discharge. Neutron emission starts after maximum separation of m = 0 instability and is most intense during the following re-expansion of the plasma column. A beam-target reaction mechanism is most probable.

60566 **(IPPJ—520) Confinement, additional heating (NBI, LHH, ECH) and current drive of stellarator plasma in JIPP T-II.** Fujita, J.; Itoh, S.; Kadota, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jun 1981. 35p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82702972.

The confinement of ohmically heated stellarator plasma is studied experimentally. The energy confinement time tau sub(E) increases with total rotational transform angle iota sub(Σ) in the case of iota sub(Σ)/2π < 0.25, that is q sub(Σ)(a) > 4, while tau sub(E) decreases with iota sub(Σ) for iota sub(Σ)/2π > 0.3, that is q sub(Σ)(a) < 3 - 4, which is consistent with the Alcator scaling. When the rotational transform angle due to helical field iotasub(h)/2π is larger than 0.14, no major disruptions are observed even for q sub(Σ)(a) as low as 1.7 (iotasub(h)/2π = 0.14, I sub(p) >= 100 kA at B sub(t) = 2.2 T), although strong MHD oscillations with low frequency (-- 1 kHz) appear when q sub(Σ)(a) < 2. Tangential injections of neutral beams are carried out for additional heating of stellarator and tokamak plasmas. With co-injection, the increase in ion temperature ΔT sub(i) at the center per injected power P sub(N) into the torus is 1.6 eV/kW in the stellarator and is 1.9 eV/kW in the tokamak configuration. In the case of counter-injection, ΔT sub(i)/P sub(N) is 1.6 eV/kW in both configurations. Lower hybrid heating with the frequency of 0.8 GHz is applied. In both cases of stellarator and tokamak, ion heating of 0.8 eV/kW is observed with input power up to 160 - 180 kW. Electron cyclotron heating by use of klystrons with frequency of 35.5 GHz is carried out. Preliminary results show heating of bulk electrons with the heating efficiency of 1.6 eV/kW. Current drive in stellarator plasma by lower hybrid wave is observed in the case of low density plasma (anti n sub(e) -- 5 x 10^{12} cm^{-3}). The efficiency of current drive is -- 0.3 kA/kW at the power level of 40 kW.

60567 **(ITF—82-67P) Space correlations of charged particles in bounded-plasma systems.** Usenko, A.S. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). May 1982. 60p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

The simultaneous correlation functions for the plasma layer, cylinder and sphere are obtained. A detailed analytic and numerical investigation of the behavior of these distributions depending on the charged particle positions, the outer medium permittivity and system dimensions is carried out. The plasma system geometry effect on the charged particle space correlations is studied.

60568 **(ITF—82-69P) Fluctuations and radiation processes in bounded active-molecular systems.** Golubinskii, P.K.; Zagorodnii, A.G.; Pegova, V.S.; Yakimenko, I.P. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). May 1982. 56p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

A theory of fluctuations and spontaneous emission of electromagnetic radiation has been developed for the case of semibounded and bounded partially-ionized plasma taking into account the thermal motion of charged particles and molecular sub-system dynamics. The influence of active molecules on the spectral distributions of fluctuations and spontaneous emission of nonequilibrium plasma half-space and a plasma layer is investigated.

60569 **(LBL—14658) Collision of fast highly charged ions in gas targets: ionization, recoil-ion production, and charge transfer.** Schalchter, A.S.; Berkner, K.H.; Beyer, H.F. (Lawrence Berkeley Lab., CA (USA); Missouri Univ., Rolla (USA). Dept. of Physics; Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.); Giessen Univ. (Germany, F.R.). Inst. fuer Kernphysik im Strahlenzentrum). Jul 1982. Contract AC03-76SF00098;AC02-82ER53128. 26p. (CONF-8206110—1). NTIS, PC A03/MF A01. Order Number DE82020067.

From Symposium on production and physics of highly charged ions; Stockholm, Sweden (1 Jun 1982).

Electron-capture, ionization, and recoil-ion-production cross sections are measured and calculated for fast highly charged projectiles in hydrogen and rare-gas targets. Recoil-ion-production cross sections are found to be large; the low energy and high charge states of the recoil ions make them useful for subsequent collision studies.

60570 **(LBL—14683) Natural Poisson structures of nonlinear plasma dynamics.** Kaufman, A.N. (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 25p. (CONF-820694—3). NTIS, PC A02/MF A01. Order Number DE82019299.

From Chalmers symposium on plasma theory and experiment; Aspenasgarden, Sweden (16 Jun 1982).

Hamiltonian field theories, for models of nonlinear plasma dynamics, require a Poisson bracket structure for functionals of the field variables. These are presented, applied, and derived for several sets of field variables: coherent waves, incoherent waves, particle distributions, and multifluid electrodynamics. Parametric coupling of waves and plasma yields concise expressions for ponderomotive effects (in kinetic and fluid models) and for induced scattering.

60571 **(ORNL/TM—8256) Electron-confinement studies on EBT-S using soft-x-ray techniques.** Hillis, D.L.; Haste, G.R.; Berry, L.A. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 49p. NTIS, PC A03/MF A01. Order Number DE82020477.

Soft x-ray bremsstrahlung measurements have been performed on the ELMO Bumpy Torus (EBT-S) plasma to determine the electron temperature T/sub e/ and electron density n/sub e/ using a calibrated Si(Li) detector over a wide range of operating conditions. The purpose of this paper is to outline the necessary assumptions and essential x-ray techniques that are inherent in soft x-ray measurements in order to investigate the electron heating and confinement properties of EBT-S. In addition, by utilizing the electron density as determined by the soft x-ray measurements, the previous EBT-S confinement analyses have been extended. The steady-state plasma of EBT-S is heated by microwaves using a cw gyrotron that can operate up to power levels of 200 kW. From the soft x-ray measurements, both the electron temperature and density are found to increase at higher microwave power levels. For operation at microwave power levels of 200 kW, T/sub e/ approaches 1 keV while n/sub e/ approaches 1.2 x 10^{12} cm^{-3}. In general, confinement properties are found to improve with increased microwave power. The data are compared with neoclassical transport scaling and the electron transport is found to be collisionless (nu/Ω < 1) as well as neoclassical.

60572 (PB—82-188939) Interaction of waves in a plasma and generation of laser-induced parametric instabilities. Scientific report series. Jha, S.S.; Srivastava, S. (Indian National Science Academy, New Delhi). 1979. 47p. NTIS, PC A03/MF A01.

Contents: Electromagnetic response functions and normal modes in a plasma; Effective hamiltonian for interactions of quantized modes; Evaluation of effective interaction vertex functions; Slowly-varying envelope approximation and steady-state parametric solutions of coupled-mode equations; Temporal growth and three-wave parametric instabilities.

60573 (PPPL—1919) Confinement studies with neutral-beam injection on PDX and PLT. Goldston, R.; Kaye, S.; Davis, S. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1982. Contract AC02-76CH03073. 32p. NTIS, PC A03/MF A01. Order Number DE82020784.

Neutral beam injection experiments on PLT and PDX have been conducted over a wider range in parameter space than previously. On PLT H^0 beams have been injected into well-confined high toroidal field, high density Ohmic plasmas, giving n/sub e/(0) tau/sub Ee/ products during injection of up to 5×10^{12} sec cm^{-3}. tau/sub Ee/ is found to rise slowly with increasing density in these experiments. Comparing these results with earlier (1979) discharges, which showed much lower heating efficiency, the importance of starting with a hot Ohmic plasma and a peaked density profile is striking. On PDX high power injection experiments over a range in plasma current have shown a significant variation with current of both ion heating and total stored plasma energy. Transport analysis of these results indicates that global confinement drops little when I/sup p/ is varied from 480 to 320 kA, but as I/sup p/ falls to 200 kA, tau/sub E/ deteriorates significantly.

60574 (PPPL—1924) Diagnostic techniques for magnetically confined high-temperature plasmas. II. Magnetic and electric measurements, charge-exchange diagnostics, particle-beam diagnostics, and fusion-product measurements. Goldston, R.J. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1982. Contract AC02-76CH03073. 67p. NTIS, PC A04/MF A01. Order Number DE82020266.

A general overview of the four diagnostic techniques is given. Prospects for each technique are discussed. (MOW)

60575 (UCID—19494) Mathematical models and illustrative results for the RINGBEARER II monopole/dipole beam-propagation code. Chambers, F.W.; Masamitsu, J.A.; Lee, E.P. (Lawrence Livermore National Lab., CA (USA)). 24 May 1982. Contract W-7405-ENG-48. 36p. NTIS, PC A03/MF A01. Order Number DE82021551.

RINGBEARER II is a linearized monopole/dipole particle simulation code for studying intense relativistic electron beam propagation in gas. In this report the mathematical models utilized for beam particle dynamics and pinch field computation are delineated. Difficulties encountered in code operations and some remedies are discussed. Sample output is presented detailing the diagnostics and the methods of display and analysis utilized.

60576 (UCID—19495) Linear and non-linear calculations of the hose instability in the ion-focused regime. Buchanan, H.L. (Lawrence Livermore National Lab., CA (USA)). 14 Jun 1982. Contract W-7405-ENG-48. 23p. NTIS, PC A02/MF A01. Order Number DE82021549.

A simple model is adopted to study the hose instability of an intense relativistic electron beam in a partially neutralized, low density ion channel (ion focused regime). Equations of motion for the beam and the channel are derived and linearized to obtain an approximate dispersion relation. The non-linear equations of motion are then solved numerically and the results compared to linearized data.

60577 (UCRL—53295) Study of impurities in the Tandem Mirror Experiment using extreme-ultraviolet spectroscopy. Strand, O.T. (Lawrence Livermore National Lab., CA (USA)). 12 May 1982. Contract W-7405-ENG-48. 142p. NTIS, PC A07/MF A01. Order Number DE82020610.

Impurities in the Tandem Mirror Experiment (TMX) have been studied using extreme ultraviolet spectroscopy. Three time-resolving absolutely-calibrated normal-incidence monochromators, one on each section of TMX, were used to study the impurity emissions in the wavelength range of 300 A to 1600 A. The instruments on the east end cell and central cell were each capable of obtaining spatially-resolved profiles from 22 chords of the plasma simultaneously while the instrument on the west end cell monitored the central chord. The impurities identified in TMX were carbon, nitrogen, oxygen, and titanium. Emphasis was placed upon determining the impurity densities and radiated power losses of the central cell; results indicate that the impurity concentrations were low - less than 0.4% for each species - and that less than 10% of the total net trapped neutral beam power was lost to radiation. The use of titanium gettering on the central cell walls was observed to decrease the brightnesses of singly- and doubly-ionized carbon and oxygen in the central cell plasma. In the end cells, oxygen was the main impurity with a concentration of about 1.5% and was injected by the neutral beams; the other impurities had concentrations of about 0.5%. Radiation losses from the end cells were negligible.

60578 (UCRL—87021) Gyrokinetic equilibrium and stability in quadrupole tandem mirrors. Bulmer, R.H.; Kaiser, T.B.; Nevins, W.M.; Newcomb, W.A.; Pearlstein, L.D.; Strauss, H.R.; Wollman, S.; Wakatani, M. (Lawrence Livermore National Lab., CA (USA); New York Univ., NY (USA). Courant Inst. of Mathematical Sciences; Kyoto Univ., Uji (Japan). Plasma Physics Lab.). 2 Aug 1982. Contract W-7405-ENG-48. 15p. (CONF-820930—8). NTIS, PC A02/MF A01. Order Number DE82020283.

From 9. international conference on plasma physics and controlled nulcear fusion research; Baltimore, MD, USA (1 Sep 1982).

This paper discusses recent theoretical work on the equilibrium and stability of quadrupole tandem mirrors in the paraxial limit. It reviews calculations of three-dimensional equilibria by means of a β-expansion technique which lead to an understanding of the important role played by parallel currents and the corollary importance of careful design of the structure of the vacuum geodesic curvature. The previously predicted scaling with central-cell length of the finite-β distortion of vacuum flux surfaces is shown to saturate because of finite orbit effects. An adaptation to tandem geometries of the reduced MHD technique for calculating high-β three-dimensional equilibria is described. This approach uses the paraxial expansion to resolve the time-dependent relaxation to equilibrium into three distinct timescales on which the motion can be followed independently. Regarding stability, it is shown that kinetic effects suppress ballooning modes of short-to-moderate perpendicular wavelength; in the limit that such effects are dominant only rigid modes are possible. The stability of the latter modes is investigated within the context of the energy principle. Results of equilibrium and stability calculations for the TMX-U and MFTF-B experiments at Livermore are presented.

60579 (UCRL—87980) Theory and simulation of laser plasma coupling-II. Kruer, W.L. (Lawrence Livermore National Lab., CA (USA)). 29 Jul 1982. Contract W-7405-ENG-48. 20p. (CONF-820848—1). NTIS, PC A02/MF A01. Order Number DE82020350.

From 24. Scottish Universities summer school in physics; St Andrews, UK (1 Aug 1982).

In previous lectures at the 1979 Scottish Universities' Summer School in Physics, we presented an introduction to the theory and simulation of laser plasma interactions. A representative mix of coupling processes was discussed. In this update lecture for the 1982 school, we will emphasize two specific topics which have received increased attention in the last few years: stimulated Raman scatter and the wavelength scaling of laser plasma coupling.

60580 (UWFDM—466) Thermal-barrier trapping current in a tandem mirror. Carrera, R.; Callen, J.D. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Jun 1982. Contract AC02-80ER53104. 42p. NTIS, PC A03/MF A01. Order Number DE82021695.

An analytic expression for the trapping current in the thermal barrier cell of a tandem mirror due to pitch-angle scattering has been obtained. The overall system is assumed to be maintained

in steady state by particle injection in the central cell and charge exchange pumping is assumed in the barrier cell. Trapping of ions in the thermal barrier due to Coulomb interactions sets an irreducible minimum against which any pumping mechanism must compete. A series of boundary value problems in the various regions of phase space is obtained based on the smallness of the bounce time with respect to the collision time. A high barrier mirror ratio, long central cell and deep barrier electrostatic potential are implicit in the analysis. For conditions of interest a Lorentz collision operator describes reasonably well the kinetic problem which we have solved using a square-well approximation. Analytic results agree with numerical results within expected limits on the order of the inverse of the barrier mirror ratio (~ 10 to 20%). A boundary layer mechanism has been proposed which limits the trapping current value as the pumping rate is increased.

60581 **(UWFDM—474) Neoclassical flows and transport in nonaxisymmetric toroidal plasmas.** Shaing, K.C.; Callen, J.D. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Jul 1982. Contract AC02-80ER53104. 52p. NTIS, PC A04/MF A01. Order Number DE82021691.

The moment equation approach to neoclassical transport theory has been generalized to nonaxisymmetric toroidal systems under the assumption of the existence of magnetic surfaces. In particular, the parallel plasma flows and bootstrap current are calculated in both the Pfirsch-Schlueter and banana regimes. It is found that both parallel plasma flows and the bootstrap current can be reduced as the toroidal bumpiness increases in an otherwise axisymmetric system.

60582 **Calculation of x-ray bremsstrahlung and characteristic line emission produced by a Maxwellian electron distribution.** McCall, G.H. (Los Alamos National Lab., NM (USA)). *Journal of Physics D: Applied Physics;* **15**: No. 5, 823-831(14 May 1982).

Using power-law least-squares fits to thick-target measurements of x-ray bremsstrahlung and characteristic line emission, analytic expressions for spectra and emission efficiencies of x-rays produced by a Maxwellian electron distribution were calculated. These expressions are particularly useful for the analysis of x-ray spectra produced by hot electrons in laser-produced plasma. The effect of self-absorption on the analysis of these spectra is estimated. It is shown that both the spectral shape and the absorption effects dictate that bremsstrahlung measurements of plasma temperature should be made at photon energies greater than kT.

60583 **Expansion of a magnetized plasma.** Johnson, S.F.; Lonngren, K.E. (Iowa Univ., Iowa City (USA)). *Physica Scripta;* **25**: No. 4, 583-586(Apr 1982).

The expansion of a magnetized, uniform quasineutral plasma into a vacuum is solved in a Lagrangian representation. For one initial condition, the solution is in terms of an integral originally derived by Anderson, Bonnedal and Lisak who treated the same problem. Another solution is found which conserves the total number of particles in the system.

60584 **Vlasov simulation of plasma double layers.** Smith, R.A. (Science Applications, Inc., McLean, VA (USA)). *Physica Scripta;* **25**: No. 2, 413-415(Feb 1982).

Evolution of electrostatic plasma double layers is simulated in a 1-D Vlasov model with novel boundary conditions, in which the double layer forms part of an RL circuit. The double layer develops from the non-linear stage of a convective, current-driven instability. Its evolution is characterized by strong trapping of both ions and electrons; ion heating appears to play a prominent role in the intermediate stages of development. Results are discussed for two cases: (i) L→infinity (constant-current); and (ii) L/R = the ion transit time.

60585 (INIS-mf—7127, pp vp) **Positive and negative ion transport to the wall.** Lergon, H.G.; Mueller, K.G. (Essen Univ. (Gesamthochschule) (Germany, F.R.)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

60586 (EUR—6584(Vol.1), pp 47-79) **Particle transport in magnetically confined plasmas.** Coppi, B.; Sharky, N. (Massachusetts Institute of Technology, Cambridge (USA)). [nd]. Dep. NTIS (US Sales Only).

From International school of plasma physics course and workshop; Varenna, Italy (28 Aug 1979).

A model is presented for explaining the particle transport in magnetically confined plasmas. Steady state density profiles of a variety of plasma columns, operating over a wide range of densities, can be reproduced if it is assumed that the particle flux is the sum of an outward and an inward directed fluxes. The outward flux, is due to a diffusion process. The inward flux in the central region is independent of the density and temperature gradients. However, in the edge region, the ion mixing mode may be excited, thereby producing an inward flux. At lower densities the so-called "Ware particle flux", related to the presence of trapped electrons, is also included in the model.

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60587 **(AD-A—112717/4) Ablative acceleration of planar targets to high velocities. Memorandum report.** Grun, J.; Obenschain, S.P.; Ripin, B.H.; Whitlock, R.R.; McLean, E.A. (Naval Research Lab., Washington, DC (USA)). 30 Mar 1982. 48p. (NRL-MR—4747). NTIS, PC A03/MF A01.

Laser irradiated targets are ablatively accelerated to velocities near those required for fusion pellet implosions while remaining relatively cool and uniform. The target velocities and velocity profiles are measured using a double-foil method, which is described in detail. Also, the ablation plasma flow from the target surface is spatially resolved, and the scalings with absorbed irradiance of the ablation pressure, ablation velocity, and mass ablation rate are determined. Results are compared with hydrodynamic code calculations.

60588 **(ANL—80-17) Report on the workshop on atomic and plasma physics requirements for heavy ion fusion, Argonne National Lab., December 13-14, 1979.** Kin, Y.K.; Magelssen, G. (Argonne National Lab., IL (USA)). 1979. Contract W-31-109-ENG-38. 26p. NTIS, PC A03/MF A01. Order Number DE82021819.

Atomic, molecular, and plasma physics areas that are relevant to inertial confinement fusion by energetic heavy ions are identified. Discussions are confined to problems related to the design of heavy ion accelerators, accumulation of ions in storage rings, and the beam transport in a reactor vessel.

60589 **(CONF-810831—93) Effect of precipitate-matrix interface sinks on the growth of voids in the matrix.** Brailsford, A.D.; Mansur, L.K. (Oak Ridge National Lab., TN (USA); Ford Motor Co., Dearborn, MI (USA). Research Staff). 1981. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE82020941.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

A qualitative discussion of the differing roles played by coherent and incoherent precipitates as point defect sinks is presented. Rate theory is used to obtain semiquantitative estimates of the growth of cavities in the matrix when either type of precipitate is present. Methods for deriving the sink strengths of precipitates of arbitrary shape are developed. In three materials where available microstructural information allows an analysis, precipitates are found to cause only a small relative suppression of cavity growth via the mechanisms here considered.

60590 **(CONF-810831—94) Material considerations in the design of a bulk shield for the Fusion Engineering Device.** Kirchner, J.; Engholm, B.A. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE82020940.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

Portions of document are illegible.

The FED bulk shield provides protection from high-energy neutrons and gamma rays and removes nuclear heat generated. Bulk shield optimization calculations were conducted using the Los Alamos ONEDANT discrete ordinates and the General Atomic PATH point kernel codes. Six candidate steel alloys were considered.

60591 (CONF-811203—Vol.1, pp 471-484) **Bumpy torus annulus startup.** Sperling, J.L.; Hamasaki, S.; Krall, N.A. (JAYCOR, San Diego, CA). Jun 1982. NTIS, PC A21/MF A01.

From 2. workshop on hot electron ring physics; San Diego, CA, USA (1 Dec 1981).

In order that a stable bumpy torus plasma configuration can be attained, it is first necessary to irradiate the plasma with sufficient external power to cause annulus formation. To estimate the power required to initiate annuli, it is assumed that quasilinear electron-cyclotron heating by microwaves is the dominant electron heating mechanism. A scaling law for required microwave power is derived which shows that annulus formation is assisted by smaller cross-section areas, lower density, lower microwave frequency, and higher C-mode temperature. The scaling law is quantitatively evaluated for NBT, EBT-1, EBT-S, EBT-P, and EBT-R parameters. The resulting power estimates are consistent with the available microwave power in previous and present experiments. In larger projected bumpy tori, like EBT-P and EBT-R, it may be necessary to initiate annulus formation at densities which are lower than in the stable T-mode so that the necessary microwave power can be reduced to reasonably modest levels. It is suggested that instabilities as well as rf heating can aid the formation of bumpy torus electron annuli. Rf experiments on NBT and EBT-S would be beneficial in determining the capability of rf power to assist annulus startup.

60592 (DOE/ET/52027—5) **Lithium doping of 316 stainless steel to simulate irradiation damage in a fusion-reactor environment. Quarterly report, April 1, 1982-June 30, 1982.** Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA)). 12 Jul 1982. Contract AC02-78ET52027. 14p. NTIS, PC A02/MF A01. Order Number DE82020800.

Lithium and boron doping techniques are possibilities for simulating simultaneous helium production and displacement damage in bulk specimens of non-nickel bearing materials such as ferritic steels when irradiated in fast-fission reactors. The rapid-solidification processing and powder-metallurgy salt-decomposition technique has been used to prepare lithium-doped austenitic stainless steel. Neutron autoradiography verified a uniform distribution of lithium in the alloy. Although the same approach can be used to dope material uniformly with a stable boron compound, thus reducing the problem of grain-boundary segregation and coarsening, it should be an advantage to use lithium doping because this dopant produces only helium and hydrogen which are also produced by the CTR environment.

60593 (DOE/ET/53016—79) **High-beta tokamak research. Annual progress report.** Gross, R.A. (Columbia Univ., New York (USA). Dept. of Applied Physics and Nuclear Engineering). Aug 1982. Contract AC02-76ET53016. 26p. NTIS, PC A03/MF A01. Order Number DE82021583.

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This report consists of a compilation of four quarterly reports. The activities described include the Torus I project and the Torus II project. Some of the engineering and diagnostics are mentioned. (MOW)

60594 (LA-UR—82-1867) **Bonded stacked-ring insulator for the Antares electron gun.** Stine, R.D.; Allen, G.R.; Eaton, E.; Weinstein, B. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 10p. (CONF-821013—2). NTIS, PC A02/MF A01. Order Number DE82017586.

From Conference on electrical insulation and dielectric phenomena; Amherst, MA, USA (17 Oct 1982).

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A large diameter insulator utilizing epoxy bonding which has sufficient mechanical strength to support the 3000 kg cathode/grid assembly was developed. Bonding the insulator simplifies the handling and reduces the number of 0-ring seals to a minimum. We have described the material selection, bonding techniques and electrical design approach.

60595 (LA-UR—82-2292) **Progress in modular-stellarator fusion-power-reactor conceptual designs.** Sviatoslavsky, I.N.; Van Sciver, S.W.; Kulcinski, G.L. (Los Alamos National Lab., NM (USA); Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). 1982. Contract W-7405-ENG-36. 16p. (CONF-820930—11). NTIS, PC A02/MF A01. Order Number DE82021921.

From 9. international conference on plasma physics and controlled nulcear fusion research; Baltimore, MD, USA (1 Sep 1982).

Recent encouraging experimental results on stellarators/torsatrons/heliotrons (S/T/H) have revived interest in these concepts as possible fusion power reactors. The use of modular coils to generate the stellarator topology has added impetus to this renewed interest. Studies of the modular coil approach to stellarators by UW-Madison and Los Alamos National Laboratory are summarized in this paper.

60596 (LBL—14796) **D7H-test results.** Caspi, S. (Lawrence Berkeley Lab., CA (USA)). 30 Jul 1982. Contract AC03-76SF00098. 19p. NTIS, PC A02/MF A01. Order Number DE82021750.

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Data were reduced from the voltage-time relations stored in files D7H001 to D7H090 on HP1000. The I-B calibration curve is included. The data base is shown and can be used by the 9845B. The data include the quench location, Q_2 layer 1 top, Q_8 layer 1 bottom and the quench current and its normalized value with respect to short sample, I/sub c/ = 4920A at 4.4 K, I/sub c/ = 6710 A at 1.8 K. The resistance (Ω/cm) was calculated using the propagation time according to the voltage change across the measured sections. The conductor potential length are $L_{5\ 9}$ = 48.6 cm, $L_{6\ 10}$ = 17.9 cm, $L_{7\ 11}$ = 40.6 cm. The turn to turn velocity V/sub t/ was calculated dividing the nominal turn to turn distance (58 mil) by the propagation time (Trans. Time). The quench time T/sub q/ was measured from the time the resistive rise starts until the energy extraction system fires.

60597 (PPPL—1926) **Several atomic-physics issues connected with the use of neutral beams in fusion experiments.** Post, D.E.; Grisham, L.R.; Fonck, R.J. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Aug 1982. Contract AC02-76CH03073. 64p. (CONF-8206110—3). NTIS, PC A04/MF A01. Order Number DE82020258.

From Symposium on production and physics of highly charged ions; Stockholm, Sweden (1 Jun 1982).

Energetic neutral beams are used for heating and diagnostics in present magnetic fusion experiments. They are also being considered for use in future large experiments. Atomic physics issues are important for both the production of the neutral beams and the interaction of the beams and the plasma. Interest in neutral beams based on negative hydrogen ions is growing, largely based on advances in producing high current ion sources. An extension of the negative ion approach has been the suggestion to use negative ions of $Z > 1$ elements, such as carbon and oxygen, to form high power neutral beams for plasma heating.

60598 (UCID—19483) **Uniform laser ablative acceleration of targets at 10^{14} W/cm^2.** Obenschain, S.P.; Whitlock, R.R.; McLean, E.A.; Ripin, B.H.; Price, R.H.; Phillion, D.W.; Campbell, E.M.; Rosen, M.D. (Lawrence Livermore National Lab., CA (USA); Naval Research Lab., Washington, DC (USA)). 10 Aug 1982. Contract W-7405-ENG-48. 13p. NTIS, PC A02/MF A01. Order Number DE82020426.

We present the first detailed investigations of the ablative acceleration of planar targets while simultaneously using high irradiance (10^{14} W/cm^2), large focal diameters (1 mm) and long laser pulse duration (3 nsec). Included are measurements of target preheat, ablation pressures and uniformity achieved under these conditions. Targets were accelerated to high velocities with velocity profile uniformity approaching that required for high gain pellet implosions.

60599 **(UCRL—15467-Pt.2) Conceptual design of a laser-fusion power plant. Part II. Two technical options: 1. JADE reactor; 2. Heat transfer by heat pipes.** (Lawrence Livermore National Lab., CA (USA); Bechtel Group, Inc., San Francisco, CA (USA)). Jul 1981. Contract W-7405-ENG-48. 59p. NTIS, PC A04/MF A01. Order Number DE82017634.

A laser fusion reactor concept is described that employs liquid metal walls. The concept envisions a porous medium, called the JADE, of specific geometry lining the reactor cavity. Some advantages and disadvantages of the concept are pointed out. The possibility of using heat pipes for passive cooling in ICF reactors is discussed. Some of the problems are outlined. (MOW)

60600 **(UCRL—50051-82-1) Mirror Fusion. Quarterly report, January-March 1982.** Harrison, M.A.; Smith, B.R. (eds.). (Lawrence Livermore National Lab., CA (USA)). 25 Jun 1982. Contract W-7405-ENG-48. 41p. NTIS, PC A03/MF A01. Order Number DE82020485.

In the Mirror Fusion Quarterly Report, we give a summary of current activities in the Magnetic Fusion Energy (MFE) program at Lawrence Livermore National Laboratory (LLNL). In a given Quarterly, not all MFE Projects are necessarily represented, and details are kept to a minimum. Readers wanting more information are encouraged to read referenced documents or to contact people engaged in the projects. The main sections of this report are: (1) confinement systems; (2) development and technology; (3) mirror fusion test facility (planning and projects); and (4) applied plasma physics.

60601 **(UCRL—52868-Rev.1) Physics of laser fusion. Volume III. High-power pulsed lasers.** Holzrichter, J.F.; Eimerl, D.; George, E.V.; Trenholme, J.B.; Simmons, W.W.; Hunt, J.T. (Lawrence Livermore National Lab., CA (USA)). 30 Oct 1981. Contract W-7405-ENG-48. 61p. NTIS, PC A04/MF A01. Order Number DE82021961.

High-power pulsed lasers can deliver sufficient energy on inertial-confinement fusion (ICF) time scales (0.1 to 10 ns) to heat and compress deuterium-tritium fuel to fusion-reaction conditions. Several laser systems have been examined, including Nd:glass, CO_2, KrF, and I_2, for their ICF applicability. A great deal of developmental effort has been applied to the ND:glass laser and the CO_2 gas laser systems; these systems now deliver $> 10^4$ J and 20 x 10^{12} W to ICF targets. We are constructing the Nova Nd:glass laser at LLNL to provide $>$ 100 kJ and $>$ 100 x 10^{12} W of 1-μm radiation for fusion experimentation in the mid-1980s. For ICF target gain $>$ 100 times the laser input, we expect that the laser driver must deliver $\sim$ 3 to 5 MJ of energy on a time scale of 10 to 20 ns. In this paper we review the technological status of fusion-laser systems and outline approaches to constructing high-power pulsed laser drivers.

60602 **(UCRL—86013-Rev.1) Optical components for the Nova laser.** Wallerstein, E.P.; Baker, P.C.; Brown, N.J. (Lawrence Livermore National Lab., CA (USA)). 17 May 1982. Contract W-7405-ENG-48. 15p. (CONF-821016—1-Rev.1). NTIS, PC A02/MF A01. Order Number DE82017294.

From 9. symposium on engineering problems of fusion research; Chicago, IL, USA (26 Oct 1982).

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In addition to its other characteristics, the Nova Laser Fusion facility may well be the largest precision optical project ever undertaken. Moreover, during the course of construction, concurrent research and development has been successfully conducted, and has resulted in significant advances in various technical areas, including manufacturing efficiency. Although assembly of the first two beams of Nova is just commencing, the optical production, including construction of the special facilities required for many of the components, has been underway for over three years, and many phases of the optical manufacturing program for the first 10 beams will be completed within the next two years. On the other hand, new requirements for second and third harmonic generation have created the need to initiate new research and development. This work has been accomplished through the enormous cooperation DOE/LLNL has received from commercial industry on this project. In many cases, industry, where much of the optical component research and development and virtually all of the manufacturing is being done, has made substantial investment of its own funds in facilities, equipment, and research and development, in addition to those supplied by DOE/LLNL.

60603 **(UCRL—86893) ARGUS disk-target experiments at 1.06 μm, 0.53 μm, 0.35 μm.** Turner, R.E.; Campbell, E.M.; Mead, W.C.; Ze, F.; Max, C.; Phillion, D.W.; Lee, P.; Pruett, B.; Tirsell, G.; Lasinski, B.F. (Lawrence Livermore National Lab., CA (USA)). 1982. Contract W-7405-ENG-48. 21p. (CONF-820435—2). NTIS, PC A02/MF A01. Order Number DE82020169.

From CLEOS conference; Phoenix, AZ, USA (14 Apr 1982).

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We report on ARGUS wavelength scaling experiments on disk targets at 1.06 μm, 0.53 μm, and 0.35 μm. Measurements were made of absorption, stimulated Brillouin and Raman scattering, and 3/2 harmonic light.

60604 **(UCRL—87454-Rev.1) Magnetic fusion energy and computers.** Killeen, J. (Lawrence Livermore National Lab., CA (USA)). 1982. Contract W-7405-ENG-48. 8p. (CONF-820810—10-Rev.1). NTIS, PC A02/MF A01. Order Number DE82020165.

From 10. international mathematics and computers simulation congress on systems simulation and scientific computation; Montreal, Canada (9 Aug 1982).

The application of computers to magnetic fusion energy research is essential. In the last several years the use of computers in the numerical modeling of fusion systems has increased substantially. There are several categories of computer models used to study the physics of magnetically confined plasmas. A comparable number of types of models for engineering studies are also in use. To meet the needs of the fusion program, the National Magnetic Fusion Energy Computer Center has been established at the Lawrence Livermore National Laboratory. A large central computing facility is linked to smaller computer centers at each of the major MFE laboratories by a communication network. In addition to providing cost effective computing services, the NMFECC environment stimulates collaboration and the sharing of computer codes among the various fusion research groups.

60605 **(UCRL-Trans—11786) Status of work on the AMBAL facility.** Dimov, G.I. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. Translation of IAEA technical committee meeting on open confinement systems, Novosibirsk, USSR, 1981. 17p. NTIS, PC A02/MF A01. Order Number DE82020330.

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A diagram of the AMBAL facility is shown. The magnetic fields in the end mirror cells have a minimum-B configuration and are generated by pairs of yin-yang coils. Some of the experimental results from the experiment are described.

60606 **(UCRL-Trans—11787) Pulsed magnesium-jet charge-exchange/trapping target for high-power neutral-hydrogen injectors.** Sokolov, V.G.; Timoshin, I.Ya. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. Translation of Preprint 81-03, Institute of Nuclear Physics, Novosibirsk, USSR, 1981. 11p. NTIS, PC A02/MF A01. Order Number DE82020333.

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A mockup of a pulsed magnesium-vapor jet target was used to study the distribution of the magnesium-vapor density in the jet, its charge-exchange properties, and its trapping properties for the cold gas from the source. The jet is formed by a plug nozzle and collimating limiters. The diameter of the charge-exchange channel is 100 mm. Given a target thickness of $\sim$ 3 x 10^{15} at-cm^{-2} and a hydrogen pulse length of 0.2 sec, the relative pressure drop across the jet reaches 400 in the range of pressures 5 x 10^{-5} to 10^{-3} torr ahead of the jet. For charge-exchange of a 10-keV H^+ beam, the H^0 yield is $\approx$ 85%.

60607 **Energy gains of a wall-confined fusion cycle.** Kmetyk, L.N.; Gross, R.A. (Plasma Physics Laboratory, Department of Applied Physics and Nuclear Engineering,Columbia University, New York, New York 10027). *Physics of Fluids;* **25**: No. 6, 1042-1048(Jun 1982). Contract AC02-76ET53016.

Calculations of energy gain are made for a wall-confined deuterium—tritium fusion cycle. Plasma, first heated by strong shock waves, re-expands to completely fill a cylindrical cavity. An azimuthal magnetic field, everywhere parallel to the walls, provides thermal insulation. The energy input is evaluated by solving the transverse magnetohydrodynamic shock wave equations. The fusion energy yield is determined by the competition between fusion burn, radiation, and wall cooling. A one-dimensional initial value code is used to evaluate the plasma energy loss rates and the fusion burn. Two-dimensional loss mechanisms are estimated using a modified form of the one-dimensional model. Energy gain ratios of twenty are calculated for a cylinder whose characteristic size L is less than one meter. Energy breakeven is found for L~0.2 m, with an energy input of 1.9 MJ at a power of 8.8 TW.

60608 **Materials pace new missions.** Blattner, C.J. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 3-6(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

It is generally considered that there have been three major technical revolutions in aerospace so far in this century: (1) The shift in construction from wood, fabric and wire to metals, principally aluminium and steel, in the 1930's, (2) The development of the gas turbine engine leading to supersonic speeds in the late 1940's, and (3) The development of the transcontinental ballistic missile and the extension of its technology into space in the late 50's and early 60's. In all three instances, materials development played a key role. We must expect that the development and improved application of materials will play a similarly important role in the development of fusion reactors.

60609 **Relation of surface interactions to first-wall and in-vessel-component (IVC) design and materials performance in fusion devices.** Conn, R.W. (California Univ., Los Angeles (USA). School of Engineering and Applied Science). *Journal of Nuclear Materials;* **103**: No. 1-3, 7-18(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Surface interactions affect the choice of in-vessel-component (IVC) materials and their coatings. Limiters, divertor components, special armor, and the first wall are subject to plasma and neutral atom bombardment at rates up to 5 x 10^{23} particles/s with particle energies ranging from several tens of eV to 2-5 keV, depending on plasma edge conditions. Neutral beam injection leads to bombardment of special beam dumps with 10-200 keV particles. Special events such as a plasma disruption can deposit hundreds of joules/cm^2 in a time of 2 to 20 ms on the limiter and first wall. Wall-produced medium or high Z impurities are detrimental to the plasma energy balance and to plasma MHD stability. Quantitative results are described to illustrate anticipated component response. Criteria are summarized which affect the design and choices of materials and coatings for in-vessel-components and the first wall.

60610 **Blanket materials for DT fusion reactors.** Smith, D.L. (Argonne National Lab., IL (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 19-30(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

This paper presents an overview of the critical materials issues that must be considered in the development of a tritium breeding blanket for a tokamak fusion reactor that operates on the D-T-Li fuel cycle. The primary requirements of the blanket system are identified and the important criteria that must be considered in the development of blanket technology are summarized. The candidate materials are listed for the different blanket components, e.g., breeder, coolant, structure, and neutron multiplier. Three blanket concepts appear to offer the most potential: (1) liquid metal breeder/coolant, (2) liquid metal breeder with separate coolant, and (3) solid breeder with separate coolant. The major uncertainties associated with each of the design concepts are discussed and the key materials R and D requirements for each concept are identified.

60611 **Materials issues in the fusion engineering device.** Nygren, R.E. (Westinghouse Hanford Co., Richland, WA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 31-40(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The design configuration and parameters of FED are described and several key design issues involving materials-related problems for components including armor, the pumped limiter, TF coils and various electrical systems, are briefly reviewed. The selected materials applications discussed illustrate design constraints arising from concerns about plasma-materials interactions, cyclic operation and neutron radiation damage. Materials testing in FED is also discussed with emphasis on a broad view of the role of FED in materials development.

60612 **Important material considerations in INTOR.** Abdou, M.A.; Mattas, R.F.; Smith, D.L. (Argonne National Lab., IL (USA)); Kulcinski, G.L. (Wisconsin Univ., Madison (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 41-50(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A number of important material-related problems were identified and analyzed during the Phase-I study for INTOR. The first wall and divertor collector plate are subjected to severe normal and off-normal conditions. A melt layer is predicted to develop in a bare stainless steel wall under plasma disruptions. Graphite tiles will not melt but they introduce other serious uncertainties into the design. The design strategy for the divertor collector plate focused on separating the surface and high heat flux problems and on utilizing a novel mechanical design concept for attaching tungsten tiles to a stainless steel (or copper) heat sink.

60613 **TASKA, a fusion engineering test facility for the 1990's.** Kulcinski, G.L.; Emmert, G.A.; Maynard, C.W.; Santarius, J.F.; Sawan, M.E. (Wisconsin Univ., Madison (USA)); Heinz, W.; Komarek, P.; Maurer, W.; Suppan, A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)); Opperman, E.K. (Hanford Engineering Development Lab., Richland, WA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 67-72(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The preliminary performance of a new Engineering Testing Reactor based on the tandem mirror confinement principle is described. This device, called TASKA, is based on near term (mid 1980's) technology and is designed to test reactor relevant technologies (superconducting magnets, blankets, materials, etc.) for the Demonstration Power Reactor envisioned for the turn of the century. The key operating parameters are a DT power level of 86 MW, a neutron wall loading of 1.5 MW/m^2, and an overall tritium breeding ratio of 1.0. Details of the materials testing program reveal that damage levels approaching 100 dpa can be achieved in less than 15 years of irradiation time. TASKA appears to be an attractive, cost effective way of achieving the near term technology testing goals for the world fusion program.

60614 **Response of fusion reactor first walls to major plasma disruptions.** Bowers, D.A.; Haines, J.R. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 81-86(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The melting and vaporization responses of a reactor's stainless steel first wall to plasma disruption heat fluxes are predicted using several analytical techniques. A comparison of the results shows that the simplest techniques can produce results which differ by orders of magnitude from the more sophisticated models. These more complex models generally exhibit good agreement over the range of heat fluxes selected, and also indicate the importance of the high temperature thermal conductivity value, especially on vaporization predictions.

60615 **Materials handbook for fusion energy systems.** Davis, J.W.; Marchbanks, M.F. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA); Hanford Engineering Development Lab., Richland, WA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 87-90(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A materials data book for use in the design and analysis of components and systems in near term experimental and commercial reactor concepts has been created by the Office of Fusion Energy. The handbook is known as the Materials Handbook for Fusion Energy Systems (MHFES) and is available to all organizations actively involved in fusion related research or system designs. Distribution of the MHFES and its data pages is handled by the Hanford Engineering Development Laboratory (HEDL), while its direction and content is handled by McDonnell Douglas Astronautics Company - St. Louis (MDAC-STL). The MHFES differs from other handbooks in that its format is geared more to the designer and structural analyst than to the materials scientist or materials engineer. The format that is used organizes the handbook by subsystems or components rather than material. Within each subsystem is information pertaining to material selection, specific material properties, and comments or recommendations on treatment of data. Since its inception a little more than a year ago, over 80 copies have been distributed to over 28 organizations consisting of national laboratories, universities, and private industries.

60616 **Effect of irradiation creep, swelling, wall erosion and embrittlement on the fatigue life of a tokamak first wall.** Watson, R.D.; Peterson, R.R.; Wolfer, W.G. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). *Journal of Nuclear Materials;* **103**: No. 1-3, 97-102(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A lifetime methodology has been developed whichcouples the long-term stress history for a generic first wall element to a two-dimensional fatigue crack growth calculation, while including, in a self-consistent manner, the detrimental effects of radiation damage. The reduction in fracture toughness due to embrittlement can reduce lifetimes by as much as a factor of 10 by accelerating stage II fatigue crack growth and enhancing the potential for birttle fracture. Swelling and irradiation creep appear not to be life-limiting, and a certain amount of wall erosion is found to enhance first wall lifetimes.

60617 **INPORT concept - an improved method to protect ICF reactor first walls.** Kulcinski, G.L.; Moses, G.A.; Sawan, M.; Sviatoslavsky, I.N.; Sze, D.K.; Vogelsang, W.F. (Wisconsin Univ., Madison (USA)); Sapp, J. (McDonnell Douglas Corp., St. Louis, MO (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 103-108(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A method to protect the first metallic walls of ICF reactors from X-rays and target debris has been developed. The concept utilizes porous, flexible tubes of woven C or SiC fibers to contain liquid metals inside the vacuum chamber of an ICF system. These porous tubes allow for ablation and recondensation of liquid metal films. The tubes also moderate the neutron spectra and reduce the displacement and transmutation damage in metallic walls.

60618 **Production and behavior of point defects in pulsed inertial confinement fusion reactors.** Sawan, M.E.; Kulcinski, G.L. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering); Ghoniem, N.M. (California Univ., Los Angeles (USA). School of Engineering and Applied Science). *Journal of Nuclear Materials;* **103**: No. 1-3, 109-114(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A time-dependent neutronics analysis for the HIBALL reactor is presented. The helium to dpa ratio in the ferritic steel structure is found to be sensitive to neutron spectrum softening. The microstructure calculations show that helium diffusivity is a sensitive function of vacancy accumulation from one pulse to the next. A strong coupling exists between the three components of damage: helium, vacancies, and interstitials. Swelling of the protected ferritic steel first wall of HIBALL is found to be insignificant.

60619 **Transient elastic stresses in ICF reactor first wall structural systems.** Lovell, E.G.; Peterson, R.R.; Engelstad, R.L.; Moses, G.A. (Wisconsin Univ., Madison (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 115-120(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Materials response modelling is used to determine transient stresses in light ion beam ICF reactor first walls. It is shown that mechanical stress from the dynamic overpressure and thermal stress from the heat flux can be of comparable magnitudes. The maximum values of each and the time at which they occur in the material can be controlled somewhat by small percentages of sodium in the cavity gas. Such characteristics can guide materials selection.

60620 **Application of high strength copper alloys for a fusion reactor first wall.** Harling, O.K.; Yu, G.P.; Grant, N.J.; Meyer, J.E. (Massachusetts Inst. of Tech., Cambridge (USA). Nuclear Reactor Lab.; Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Materials Science and Engineering). *Journal of Nuclear Materials;* **103**: No. 1-3, 127-132(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

High strength copper alloys can be produced by advanced powder metallurgical processes. These materials are considered for application as primary structural alloys in fusion reactors. Comparisons are made, for relevant properties, with other candidate structural alloys such as austenitic stainless steel and refractory metal alloys. Advanced copper alloys are sufficiently attractive to warrant further consideration for the fusion reactor application.

60621 **Preliminary evaluation of beta-spodumene as a fusion reactor structural material.** Kelsey, P.V. Jr.; Schmunk, R.E.; Henslee, S.P. (EG and G Idaho, Inc., Idaho Falls (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 145-148(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Beta-spodumene was investigated as a candidate material for use in fusion reactor environments. Properties which support the use of beta-spodumene include good thermal shock resistance, a very low coefficient of thermal expansion, a low-Z composition which would result in minimum impact on the plasma, and flexibility in fabrication processes. Specimens were irradiated in the Advanced Test Reactor (ATR) to a fluence of 5.3×10^{22} n/m², E > MeV, and 4.9×10^{25} n/m² thermal fluence in order to obtain a preliminary evaluation of the impact of irradiation on the material. Preliminary data indicate that the mechanical properties of beta-spodumene are little affected by irradiation. Gas production and release have also been investigated.

60622 **Evaluation of the application of fracture mechanics procedures to fusion first wall structures.** Odette, G.R. (California Univ., Santa Barbara (USA)); Ritchie, R.O. (California Univ., Berkeley (USA)); McConnell, P.; Server, W. (Fracture Control Corp., Santa Barbara, CA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 149-154(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

An analysis of the application of J integral based elastic-plastic fracture mechanics procedures to fusion structures is carried out. Some limiting flaw-structure geometries are specified along with estimates of upper- and lower-bound service properties of a martensitic stainless steel. Size requirements for J procedures in unconstrained flow geometries and for low strain-hardening conditions result in a small range of valid application even for lower-bound properties. In constrained deformation geometries the range of application is extended for lower-bound properties. Failure of J procedures is shown to coincide with approach to fully-plastic fracture, which can be treated partly with limit-load or net-section stress criteria.

60623 **Dynamic response of fusion reactor components with temperature-dependent properties.** Singhal, S.N. (Shell Development Co., Houston, TX (USA)); Lovell, E.G. (Wisconsin Univ., Madison (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 155-160(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Transient response of thin, elastic, fluid filled semicircular cylindrical shells to thermal loads is developed using a combination of perturbation and spectral techniques applied to classic shell equations modified for variable material characteristics. The procedures are used to obtain displacements and stresses for cavity wall components of the laser fusion hybrid reactor SOLASE-H for three materials: 316 SS, graphite and zircaloy. Liquid sodium reduces the natural frequencies and the forced vibration response. A comparison of results for the three materials shows that although stresses are primarily determined by rates of change of elastic modulus and thermal strain coefficient, the effect of variable modulus is dominant.

60624 **Failure criteria for fusion reactor first wall structural design.** Adegbulugbe, A.O.; Meyer, J.E. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering; Massachusetts Inst. of Tech., Cambridge (USA). Nuclear Reactor Lab.). *Journal of Nuclear Materials;* **103**: No. 1-3, 161-166(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The fusion reactor first walls will be operated under severe conditions, i.e., high temperature and high radiation damage conditions. Because of the demanding conditions in which they must operate, fusion first walls can fail by various modes. Structural design rules are presented to guard against four major possible modes of failure; excessive deformation, cyclic damage at elevated temperature, propagation of flaws, and radiation damage. Lifetime calculations of fusion first walls based on these design rules are presented to demonstrate the application of these rules.

60625 **Thermal stress in materials heated internally by radiation absorption.** Thomas, J.R. Jr.; Singh, J.P.; Hasselman, D.P.H. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mechanical Engineering; Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Materials Engineering). *Journal of Nuclear Materials;* **103**: No. 1-3, 167-172(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Analysis and results are reported for thermal stress in materials heated internally by radiation absorption. Two modes of heating are considered: radiation suddenly applied from one side and held constant thereafter, and radiation incident from one side but having a periodic variation in time. In both cases it is found that the radiation absorption coefficient plays a large role in determining the thermal stress, and conclusions are drawn concerning desirable optical thicknesses. With periodic heating, the stress can cycle between tensile and compressive values. This phenomenon could be especially significant for materials prone to cyclic fatigue failure.

60626 **Coated limiter testing in tokamaks.** Whitley, J.B.; Mullendore, A.W.; Mattox, D.M. (Sandia National Labs., Albuquerque, NM (USA)); Trester, P.W. (General Atomic Co., San Diego, CA (USA)); Emerson, L.C. (Oak Ridge National Lab., TN (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 181-186(Mar 1982).

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Over the past year, extensive operating experience has been gained with coated graphite limiters in the ISX-B and Doublet III tokamaks. A total of approximately 20,000 tokamak discharges have been performed with TiC coated limiters, and the plasma performance and capability with these limiters has been improved over that obtained with metallic limiters. While none of the limiters have failed while in service, the TiC coating and in some cases the graphite substrate have experienced damage. This damage consists of grooves formed in the coating and an area of coating melt and graphite cracking. The groove damage is believed to have been caused by disruptions and the melt region by the high heat loads during neutral beam heated discharges.

60627 **Performance of TiC-coated graphite in electron beam tests and Doublet III operation.** Sevier, D.L.; Trester, P.W.; Hopkins, G.; McKelvey, T.E.; Taylor, T.S. (General Atomic Co., San Diego, CA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 187-192(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Power density limits were determined as a function of time for titanium carbide coated POCO graphite exposed to a localized electron beam. Typical coating degradations are reviewed and compared to the deterioration of the TiC coating of the Doublet III (DIII) graphite limiter. The design of the movable primary limiter and its operational performance in DIII are reviewed.

60628 **Process evaluation and characterization of TiC coating on graphite for Doublet III limiters and neutral beam armor.** Trester, P.W.; Sevier, D.L.; Chin, J.; Horner, M.H.; Staley, H.G. (General Atomic Co., San Diego, CA (USA)); Kaplan, R. (Ultramed, Inc., Pacoima, CA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 193-198(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

An investigation was conducted to evaluate a thin coating of TiC deposited on a graphite substrate by a commercial CVD coating process. Microstructural analyses are presented for specimens positioned at quality and uniformity were met. These findings provide the data base for production coating graphite neutral-beam armor and limiter tiles for tokamaks.

60629 **Operational history of stainless steel, TiC, TiB_2, and boron limiters in the ISX-B tokamak.** Emerson, L.C.; Bush, C.E.; Isler, R.C.; Langley, R.A.; Clausing, R.E.; Saltmarsh, M.J. (Oak Ridge National Lab., TN (USA)); Whitely, J.B.; Mullendore, A.W. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 199-204(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

For the past eighteen months a variety of low-Z coatings have been tested for service a limiters in both ohmically-heated and beam-heated ISX-B plasmas. To date TiC, TiB_2, and B coatings on a graphite substrate have been examined with TiC providing the best results of the three. The history of these materials in ISX-B is reviewed and compared with previously used stainless steel limiters with particular emphasis on machine performance.

60630 **Changes in near-surface microstructure of metallic limiters following one year of service in Doublet III.** Trester, P.W.; Sevier, D.L. (General Atomic Co., San Diego, CA (USA)); Sabado, M.M. (Ebasco Services, Inc., Princeton, NJ (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 205-210(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The structural alloys Ta-10W, Mo, and Inconel X-750 were used for plasma limiters during the 3-MW ohmic heating experiments of the Doublet III (DIII) tokamak. Postservice examinations of these limiters are reviewed. Near-surface melting, cracking, and microstructural changes are shown and discussed. During DIII service, elements from other metallic components were transported by the plasma and deposited on the limiter surface; significantly, high concentrations of Ni, Fe, Mo, and C were detected in the regions found to be microcracked in the Ta-10W. Observations and analyses are made that are relevant to the design of limiter and armor components for larger tokamaks.

60631 **Structured composite limiters for ablation control in fusion devices.** Hopkins, G.; Trester, P. (General Atomic Co., San Diego, CA (USA)); Whitley, J. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 211-216(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A carbon-silicon carbide alloy (C-SiC) material shows promise for limiters and plasma interface components in tokamak devices because of its low sputtering rate. High heat flux pulsed energy deposition studies have been performed on this material to simulate plasma disruption heat loads and results are described herein. Blistering of composite materials has been proposed as a self-protective mechanism for limiters in disruptive heat loads and experimental verification of this concept with the C-SiC coating on POCO graphite substrate is described. Additionally, the coating was found to adhere up to the onset of cracking in the graphite substrate (200 MW/m^2 for 0.3 s energy pulses). The results here enhance the promise of this material as a candidate for limiters and plasma interface components in fusion devices and eventual fusion reactors.

60632 **Materials selection for the U.S. INTOR divertor collector plate.** Mattas, R.F.; Misra, B.; Smith, D.L. (Argonne National Lab., IL (USA)); Morgan, G.D.; Delaney, M. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)); Gold, R.E. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.). *Journal of Nuclear Materials;* **103**: No. 1-3, 217-222(Mar 1982).

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The divertor collector plate in the INTOR reactor will be subjected to high heat, particle, and neutron fluxes, making it the most severely damaged torus component. The collector plate is composed of a protection plate, which is directly exposed to the particle flux, and a heat sink which provides support for the protection plate and carries the water coolant. The high-Z refractory metals have been considered for use as the protection plate material, and austenitic stainless steels and copper alloys have been considered as the heat sink material. Tungsten and Type 316 stainless steels have been selected for the protection plate and heat sink, respectively. The protection plate has a sputtering lifetime of 1.75 y at a 50% duty factor, while the heat sink is expected to last the lifetime of the reactor.

60633 **Material considerations for the fusion engineering device (FED) pump limiter.** Haines, J.R.; Cramer, B.A.; Davisson, J.B.; Mantz, H.C. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA); Oak Ridge National Lab., TN (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 223-228(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A mechanical pump limiter is provided in the Fusion Engineering Device (FED) to establish the plasma edge, to exhaust plasma particles, to handle a significant fraction of the plasma heat load, and to protect the first wall from large particle and energy fluxes. Various protective surface materials were evaluated for applicability to the limiter. Bare metal and armor tile design concepts were considered. The protective surface concept selected for the baseline FED limiter consists of graphite tiles brazed to a water cooled copper substrate. Graphite and copper were selected because of their resistance to damage at high heat fluxes, the low atomic number of graphite, and the potential for reliable brazing of copper and graphite.

60634 **Design considerations for a nonmagnetic divertor in an Elmo Bumby Torus reactor.** Driemeyer, D.; Stones, P.; Bowers, D. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)); Krakowski, R. (Los Alamos National Lab., NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 229-234(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Pumped-limiter impurity-control concepts offer many potential advantages relative to magnetic divertors, provided that viable means of controlling limiter surface heating and erosion can be identified. This is especially true for the EBT where the close coupling of plasma transport, magnetic topology, and the electron rings give added impetus to assessing a nonmagnetic impurity control system. This paper discusses physics, engineering, and design considerations associated with the incorporation of a pumped limiter system in an EBT reactor. Models which have been developed to describe the interplay between the limiter, the plasma, and other reactor subsystems such as those for vacuum pumping and limiter/first wall cooling are presented along with a brief description of the resulting EBTR limiter configuration.

60635 **In-situ maintenance of low-Z limiters in reactors.** Norem, J.H. (Argonne National Lab., IL (USA)); Cramer, B.A. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA); Fusion Engineering Design Center, Oak Ridge, TN (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 235-238(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The primary engineering problems associated with pump limiter designs are related to the high erosion rates on material exposed to the plasma and the resulting plasma contamination. A model is developed based on sputtering, including motion of ions in the scrape-off region, to show that redeposition or sputtered material reduces effective erosion rates considerably. The addition of material in theedge region can, in principle, reduce the net erosion to zero.

60636 **Self-sustaining thin films as a means of reducing first wall erosion and plasma impurity influx.** Krauss, A.R.; Gruen, D.M. (Argonne National Lab., IL (USA). Chemistry Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 239-244(Mar 1982).

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Neutral impurities ejected from Tokamak wall and limiter surfaces may travel several cm before being ionized very quickly upon entering the plasma edge. The influence of the unipolar sheath potential is exerted only within a very short distance of the surface and has no effect on neutral impurity atoms within a very short distance of the surface and has no effect on neutral impurity atoms which are subsequently ionized by charge-exchange collisions or electron impact ionization. However, secondary ions emanating from the limiter surfaces with kinetic energies less than the sheath potential will have essentially zero probability of traveling more than a few Debye lengths before being redeposited. Similarly, secondary ions originating at the first wall are redeposited as a result of the deflection produced by the magnetic field. Impurity influx resulting from sputtering would therefore be substantially reduced for surfaces which produce a very high ion/neutral ratio when sputtered. It has been previously shown that the high secondary ion yield associated with the alkali metal potassium does not apply to the bulk metal but pertains to ionic compounds and thin (mono-layer) films. Two processes are discussed as a means of producing these films in a self-sustaining manner compatible with the fusion reactor environment.

60637 **Coating requirements for an ICF dry wall design.** Taylor, L.H.; Sucov, E.W. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 245-250(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A new concept for protecting the first wall of an ICF reactor has been developed which relies heavily on a coating to protect the steel tubes which comprise the first wall. This coating must survive the pellet explosion, be ductile, and be compatible with the materials in the ICF pellet. Calculations indicate that tantalum is the best choice for the coating material and that tantalum coated steel tubes can handle fusion thermal powers of 3500 MW in a 10 m radius spherical chamber.

60638 **Thermal fatigue properties of coated materials for fusion device applications.** Mullendore, A.W.; Whitley, J.B.; Mattox, D.M. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 251-256(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The adherence of plasma sprayed coatings of TiC, VC, TiB_2 and B on substrates of Cu, 316 SS, Mo, Ta and Poco AXF-5Q arti-

ficial graphite has been evaluated in a pulsed electron beam, thermal fatigue environment. The materials are candidates for application as limiter and armor components of tokamak fusion devices. Up to 500 cycles of heating at power densities of 1.5 kW/cm² for 1.5 sec. were used. Materials were tested both in the as-sprayed (19-33% porosity) condition and after hot isostatic pressing (HIP) to increase coating density. Some (e.g. TiC on Mo and Ta) showed good survivability in both the as-sprayed and HIP densified conditions. TiB_2 on Mo and Ta and VC on Poco graphite were improved while TiC + V on Mo and Ta were degraded by the HIP treatment.

60639 **High-speed photographic observation of plasma-limiter interactions in ISX-B.** Clausing, R.E.; Emerson, L.C.; Heatherly, L. (Oak Ridge National Lab., TN (USA). Metals and Ceramics Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 309-314(Mar 1982).

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High-speed motion pictures confirm that arcing occurs during periods of plasma instability in ISX-B. Various types of plasma-limiter interactions are described and illustrated. Arcing and other visible phenomena are correlated to plasma parameters.

60640 **Effects of neutral beam injection and gas puffing on deuterium and impurity levels in the scrapeoff layer of ISX-B.** Zuhr, R.A.; Roberto, J.B.; Withrow, S.P. (Oak Ridge National Lab., TN (USA). Solid State Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 315-320(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Plasma-material interactions in the scrapeoff region of a tokamak nave important effects on the overall performance of the machine. In order to prudently select the most appropriate materials for walls, limiters and armor plate, it is necessary to characterize the plasma that interacts with these surfaces and to understand what effect different modes of operation of the tokamak have on plasma characteristics. We have made a series of measurements on the ISX tokamak using deposition probe techniques to identify and quantify the impurities ($Z >= 8$) in the limiter shadow, and to determine the temporal behavior of both impurity and plasma particles in this region. These measurements have been made under a variety of tokamak operating conditions, including both ohmic and neutral beam heated discharges. The results are interpreted in terms of edge conditions, impurity introduction, gas puffing, and the relative importance of wall and limiter contributions.

60641 **Vaporization and melting of materials in fusion devices.** Hassanein, A.M.; Kulcinski, G.L.; Wolfer, W.G. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). *Journal of Nuclear Materials;* **103**: No. 1-3, 321-326(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

High energy fluxes on first wall materials and other components are encountered in magnetic fusion devices, particularly during hard plasma disruptions. A model to predict evaporation and melting is described which contains a formulation of the evaporation kinetics based on transport theory results. The effect of vapor shielding is evaluated under the assumption that plasma ions slowed down in the vapor dissipate their energy in an isotropic manner. Specific results on melting and evaporation are given for 316 SS, Mo, and graphite.

60642 **First wall evaporation in inertial confinement fusion reactors utilizing gas protection.** Hassanein, A.M.; McCarville, T.J.; Kulcinski, G.L. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). *Journal of Nuclear Materials;* **103**: No. 1-3, 327-332(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The evaporation of inertial confinement fusion first wall materials from unattenuated pellet X-rays and from radiation emitted by a cavity buffer gas is examined. The low vapor pressure and low X-ray attenuation coefficient of carbon give it a lower erosion rate than stainless steel, despite the larger thermal conductivity of Type 316 stainless steel. For the argon buffer gas containing 0.2% Na and pellet yield used in this study, a gas density greater than 0.3 torr (0°C) is required to prevent evaporative erosion of a carbon first wall. A gas density greater than 0.9 torr (0°C) is needed to prevent erosion of a stainless steel wall.

60643 **Behavior of boron coatings under simultaneous ion bombardment and temperature cycling.** Andresen, H.; DiPietro, S.G.; Kohse, G.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA). Nuclear Reactor Lab.). *Journal of Nuclear Materials;* **103**: No. 1-3, 363-368(Mar 1982).

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Low Z boron coatings have been tested for stability under simulated fusion reactor conditions including simultaneous temperature cycling and ion implantation from the $^{1-}B(n,\alpha)^7Li$ reaction. Boron coatings several microns thick, produced by vacuum evaporation onto heated titanium substrates, exhibited reasonable stability after doses of 3.8×10^{18} α/cm^2 and 1320 temperature cycles from 165-490°C. These conditions correspond to exposures at the first wall of the fusion reactor, ranging from a few weeks to about six months, depending on the reactor design.

60644 **Hydrogen recycling of stainless steels.** Wilson, K.L. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 453-464(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The hydrogen retention and release characteristics of stainless steels that contribute to plasma-wall recycling of a magnetically confined plasma are reviewed. Details are presented on laboratory measurements of hydrogen reflection, desorption, trapping and release. Critical data needs are shown to include reflection below 100 eV, desorption cross sections at realistic energies, hydrogen surface coverage, and molecular recombination rates for characterized first wall surfaces.

60645 **Electron enhanced hydrogen attack on first wall materials.** Ashby, C.I.H.; Rye, R.R. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 489-492(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The reactivity of graphite, TiC, and TiB_2 with atomic hydrogen under simultaneous electron bombardment is reported. Methane production yield enhancements in terms of additional methane molecules formed per incident electron are reported from 315 to 510K for oriented pyrolytic graphite and at 315K for TiC. Enhancements for graphite and TiC result in yields from combined atomic hydrogen attack and electron bombardment comparable to hydrogen ion sputtering yields, and these yields are more than an order of magnitude greater than those for atomic hydrogen alone. TiB_2 was not observed to form volatile boron compounds at 315K under electron bombardment, or up to 640K under atomic hydrogen attack alone. Sample temperature, hydrogen flux, electron flux, and electron energy are major interdependent parameters influencing erosion rates.

60646 **Trapping of deuterium in helium-damaged steels: He^+ fluence dependence.** Wilson, K.L.; Pontau, A.E.; Haggmark, L.G.; Baskes, M.I. (Sandia National Labs., Albuquerque, NM (USA)); Bohdansky, J.; Roth, J. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). *Journal of Nuclear Materials;* **103**: No. 1-3, 493-498(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Deuterium trapping characteristics of 304 LN and 12R72HV stainless steel have been measured as a function of He^+ predamage fluence with 8 keV He^+. Nuclear reaction analyses of the near surface deuterium with the $D(^3He,\alpha)H$ and $D(^3He,p)^4He$ reactions show that the deuterium saturation concentration increases with increasing He^+ fluence, up to a maxiumum concentration of approx. equal to 0.06 deuterium/metal ratio for 10^{17} He^+/cm^2 predamage fluence. At higher He^+ predamage fluences, the saturation deuterium concentration decreases markedly, dropping to only approx. equal to 0.02 deuterium/metal ratio with 10^{19} He^+/cm^2 predamage

fluence. This decrease in deuterium trapping at high He^+ fluence is attributed to the formation of He-induced blisters and microporosity, lowering the number of traps, and also reducing the characteristic diffusion length from the trapped deuterium to the free surface.

60647 **Ion impact desorption and hydrogen release.** Bastasz, R.; Haggmark, L.G. (Sandia National Labs., Livermore, CA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 499-502(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Desorption cross sections have been measured for the removal of deuterium from stainless steel by hydrogen ion impact. Using hydrogen ions with energies similar to those in the charge-exchange neutral flux striking the first-wall in tokamaks, the desorption cross section was determined for substrate temperatures < 170 K as a function of incident particle energy (in the range 300-1500 eV) and impact angle (30° to 80° with respect to the surface normal). Calculations of the cross section made with a modified version of the TRIM code are in good agreement with the experimental data. With the appropriate cross section information it becomes possible to estimate the release rate of surface hydrogen due to impact desorption expected during reactor operation.

60648 **Trap activation model for hydrogen retention and isotope exchange in some refractory materials.** Brice, D.K.; Doyle, B.L. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 503-508(Mar 1982).

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Our recently-developed Local Mixing Model (LMM) has been successful in describing and predicting the properties of hydrogen retention and isotope exchange for a variety of refractory materials. For some materials, however, the detailed predictions of the LMM are not observed. A Trap Activation Model (TAM) is proposed here to account for the observed departures from the LMM. Comparison of experimental room temperature saturation depth profiles for $H^+ \rightarrow Si$ with the predictions of TAM suggests that the hydrogen traps are multiple-vacancy complexes in this system. The observed profiles result from a beam-induced competition between trap creation/annihilation and H-trapping/detrapping.

60649 **Depth resolved measurements of hydrogen isotope exchange in carbon.** Wampler, W.R. (Sandia National Labs., Albuquerque, NM (USA)); Magee, C.W. (RCA Labs., Princeton, NJ (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 509-512(Mar 1982).

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High resolution measurements of the depth profiles of hydrogen and deuterium implanted in carbon were made using SIMS. Nuclear reaction analysis was used to calibrate the concentration scales for the deuterium. The depth profiles of low fluence H and D implants show the D extends to slightly greater depths than the H at 1.5 keV. The retention of deuterium at high fluences was in good agreement with predictions of a saturation model. Depth profiles were also measured on samples implanted with $10^{16}D/cm^2$ at 1.5 keV followed by hydrogen implants of $2 \times 10^{17}H/cm^2$ and $10^{16}H/cm^2$ at the same energy. A comparison between these measured profiles and profiles calculated using the local mixng model shows that the model predicts the depth dependence of the H, D exchange reasonably accurately.

60650 **Hydrogen recycling and impurities during isotopic exchange in ISX-B.** Roberto, J.B.; Isler, R.C.; Kasai, S.; Murray, L.E.; Simpkins, J.E.; Withrow, S.P.; Zuhr, R.A. (Oak Ridge National Lab., TN (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 531-534(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Working gas composition and edge impurity levels have been monitored during H-D changeover for non-gettered, ohmic discharges in the ISX-B tokamak using optical spectroscopy, mass spectrometry, and surface probe analysis. The isotopic exchange in the plasma is approx. equal to 80% complete within the first 15 ms of the first discharge in the new isotope, but requires approx. equal to 10 discharges to reach 98% completion. Fe edge densities increase by a factor of approx. equal to 3 for D as compared to H plasmas, whereas 0 levels remain comparable for D and H operation. The changeover results indicate that the plasma isotopic composition in ISX-B is dominated by the fill gas, and that most of the smaller contribution from isotopic exchange with exposed surfaces is completed early in the discharge. The impurity data suggest a hydrogen sputtering mechanism for heavy impurity introduction and a chemical process for 0 release.

60651 **Regeneration of passive helium pumping.** Pontau, A.E.; Layne, C.B.; Bauer, W. (Sandia National Labs., Livermore, CA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 535-538(Mar 1982).

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In a tokamak, the applicability of passive pumping of helium ions accelerated across the plasma sheath is dependent on the ability to regenerate pumping surfaces. The regeneration of passive trapping of 4 keV He ions normally incident on Ni has been studied via thermal and laser annealing. It was found that He can be trapped up to a fluence of approx. equal to1 x 10^{17} He/cm^2 at room temperature after annealing treatments above 675-925K. Annealing treatements at 675K between bombardment runs resulted in very little degradation of trapping capacity for seven successive runs. Trapping capacity was also successfully restored after a single 1.5 μs laser pulse of 3 J/cm^2 at a wavelength of 580 nm. It appears that a number of simple surface treatments can be used to regenerate He pumping and hence extend the attainable tokamak discharge length in early DT fusion devices.

60652 **Compatibility of the Zr-Al alloy with a tokamak plasma environment.** Knize, R.J.; Cecchi, J.L.; Dylla, H.F. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Journal of Nuclear Materials;* **103**: No. 1-3, 539-544(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

We have investigated the compatibility of the Zr-Al alloy bulk getter with a tokamak plasma environment, where the hydrogenic fluxes are sufficient to cause embrittlement in relatively short times. Under normal operating conditions with the getters activated, it is necessary to regenerate the absorbed hydrogenic species before the embrittlement limit is reached. We present a method for determining the loading under tokamak conditions where the Zr-Al surface characteristics can change. During glow discharge cleaning and pulse discharge cleaning, it is not convenient to regenerate. We find, however, that during the cleaning operations the getter self-inerts, thus limitng the loading. We present data and a model which accounts for this behavior in terms of impurity adsorption on the room temperature getter surface during the cleaning operations.

60653 **Solid breeder materials.** Johnson, C.E.; Clemmer, R.G. (Argonne National Lab., IL (USA)); Hollenberg, G.W. (Hanford Engineering Development Lab., Richland, WA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 547-554(Mar 1982).

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Increased attention is being given to the consideration of lithium-containing ceramic materials for use as breeder blankets in fusion devices. These materials, e.g., Li_2O, γ-$LiAlO_2$, Li_4SiO_4, Li_2ZrO_3, etc., are attractive because of their inherent safety advantages. At present, there is a board scope of laboratory and irradiation activities in force to provide the requisite data enabling selc-tion of the prime candidate solid breeder material.

60654 **Interactions of solid ceramic breeding materials with structural alloys.** Chopra, O.K.; Smith, D.L. (Argonne National Lab., IL (USA). Materials Science Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 555-560(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The reactivity of solid Li_2O, $LiAlO_2$, and Li_2SiL_3 breeding materials with several commercial alloys has been investigated at 873 and 973 K. The results show that Li_2O is the most reactive and

$LiAlO_2$ is the least reactive of the three breeding materials. The alloy specimens in contact with $LiAlO_2$ show a weak interaction and the reaction scales essentially consist of chromium and/or iron oxide. The surface scales on Type 316 stainless steel and HT-9 alloy exposed with Li_2O ceramic contain Li_5FeO_4 and $LiCrO_2$ compounds, whereas $Li_2Ni_8O_{10}$ and $LiCrO_2$ are observed on Inconel 625 specimens. The formation of Li_5FeO_4 compound may explain the greater interaction between the specimens and Li_2O material.

60655 **Compatibility study of solid ceramic breeder materials.** Finn, P.A.; Breon, S.R.; Chellew, N.R. (Argonne National Lab., IL (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 561-566(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A high temperature (873 K) test of the compatibility of ceramic solid breeders (Li_2O, γ-$LiAlO_2$ and Li_2SiO_3) with candidate structural materials (Type 316 stainless steel, HT-9, Inconel-625, and Ti-6242) was done for 1900 h. Scale formation was greatest for the Li_2O/alloy couples; Li_5FeO_4 was observed in the Li_2O/HT-9 and Li_2O/316 SS scales; and $LiCrO_2$ was observed in most scales.

60656 **Fusion reactor blanket and coolant material compatibility.** Jeppson, D.W.; Keough, R.F. (Hanford Engineering Development Lab., Richland, WA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 567-572(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Fusion reactor blanket and coolant reaction tests are being conducted to aid in the selection and design of compatible blanket and coolant systems for future fusion reactors. Results of scoping compatibility tests to date are reported for blanket material and water interactions at near operating temperatures. These tests indicate the quantitative hydrogen release, the maximum temperature and pressures produced and the rates of interactions for selected blanket materials.

60657 **Preparation, characterization, and chemistry of solid ceramic breeder materials.** Arons, R.M.; Poeppel, R.B. (Argonne National Lab., IL (USA). Materials Science Div.); Tetenbaum, M.; Johnson, C.E. (Argonne National Lab., IL (USA). Chemical Engineering Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 573-578(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A method is presented for the preparation of pure Li_2O and $LiAlO_2$ from Li_2CO_3. A method for quantitative estimation of LiOH as a contaminant in Li_2O is also described, along with results for LiOH contamination in Li_2O samples obtained from various sources. Limited results are presented on the effect of moisture content in a helium carrier gas on the volatility of Li_2O. By means of gas-solid equilibration techniques, the apparent solubility of LiOH in LI_2O has been estimated to be 0.003 wt% at 1098 K, giving an estimated hydrogen concentration of 1 wppm.

60658 **Preparation of solid tritium breeding compounds for fusion reactors.** Suiter, D.J.; Davis, J.W.; Kirkpatrick, B.A. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 579-584(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A new approach has been developed to produce high purity, fine grained lithium orthosilicate (Li_4SiO_4) and lithium metazirconate (Li_2ZrO_3). This technique is based on an organometallic process in which the constituents are mixed in solution, dried to an organometallic complex, and finally calcined to the desired fine grained oxide powder. Using this method, Li_2CO_3, $ZrOCl_2 \times xH_2O$, and commercial tetraethylorthosilicate (TEOS) were processed into high purity, fine grained (0.7-1.0 μm) Li_2ZrO_3 and Li_4SiO_4 powders respectively.

60659 **Irradiation study of lithium compound samples for tritium breeding application.** Yang, L.; Medico, R.; Baugh, W.; Schultz, K. (General Atomic Co., San Diego, CA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 585-590(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Fifty-four Inconel-600 clad $LiAlO_2$, Li_2O, Li_4SiO_4 and Li_7Pb_2 samples were prepared and irradiated in the Oak Ridge Reactor at 600°-1000°C for a period of about six months to a fast neutron fluence (>0.18 MeV) of 1.1-2.7 x 10^{25} n/m^2. This paper describes the fabrication techniques for these samples and the post-irradiation examination results of the microstructures of these compounds and their compatibility with the cladding material.

60660 **Transformation in lithium orthosilicate.** Hollenberg, G.W. (Hanford Engineering Development Lab., Richland, WA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 591-596(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Lithium orthosilicate is being considered as a solid breeder material for blanket application in fusion devices. A transformation was observed at 665°C, but it appears to be displacive, rapid and reversible. The transformation results in very little volume change and consequently is not a direct limitation on the adoption of Li_4SiO_4 in blanket designs.

60661 **Thermal conductivity measurements of insulators for fusion blankets.** Horn, F.L.; Fillo, J.A.; Powell, J.R. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 597-602(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Alumina-silica mat (8 lb/ft^3) varied in thermal conductivity in air and Ar from 0.06 W/m- K at 300°C to 0.22 W/m- K at 1000°C, but in He it increased to 0.24 W/m- K at 300°C and 0.54 W/m- K at 1000°C, while in steam it was about midway between these values. The carbon and graphite felts behaved similarly, but the rigid and denser (24 lb/lt^3) zirconia fiberboard exhibited superior insulating properties: 0.07 W/m- K at 300°C and 0.14 W/m- K at 1000°C in air and Ar, and 0.13 W/m- K at 300°C and 0.17 W/m- K at 1000°C in steam, but rising to 0.15 W/m- K at 300°C and 0.49 W/m- K at 1000°C in He. The lighter zirconia felt (14 lb/ft^3) in steam at 1000°C was thought to be best at 0.23 W/m- K and only 0.40 W/m- K in He at 1000°C.

60662 **Impact of blanket and shield materials on cost of an EBT fusion power plant.** Zuckerman, D.S.; Waganer, L.M. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)); Dudziak, D.J.; Bathke, C.G. (Los Alamos National Lab., NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 603-608(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

A parametric analysis of the effects of neutron multiplier, breeder and shield configurational changes on the cost of an EBTR power plant has been conducted. The use of a tungsten-lead mixture in the coil-plane shield has a slightly negative effect on the reactor economics, contrary to previous expectations. Variation of the beryllium multiplier thickness and density, $LiA10_2$ breeder thickness, and Li^6 enrichment all affect the cost of electricity. Variation of beryllium cost has a stronger cost impact, implying the importance of determining the real costs of resources in a mature fusion economy.

60663 **Material considerations in the fusion engineering device (FED) bulk shield design.** Kirchner, J.; Engholm, B.A. (Oak Ridge National Lab., TN (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 609-614(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The Fusion Engineering Device (FED) bulk shield provides protection from high energy neutrons and gamma rays and removes nuclear heat generated. Bulk shield optimization calculations were conducted using the Los Alamos ONEDANT discrete ordinates and the General Atomic PATH point kernel codes. Six candidate steel alloys were considered.

60664 **Neutron-induced helium implantation in helium coolant pipes of fusion reactors.** Yamada, H. (Argonne National Lab., IL (USA). Materials Science Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 615-618(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The neutron-induced implantation of energetic helium particles in the interior surface of the helium coolant pipes near the first wall of a controlled thermonuclear reactor has been studied analytically. A flux of energetic recoil helium particles as high as 1.0 x 10^{10} He x cm^{-2} x 2^{-1} has been calculated for the interior surface of 2-cm-diameter pipe made of Type 316 stainless steel near the first wall of a Tokamak fusion reactor with a power density of 1 MW/m^2. The calculated profile of the helium implantation rates indicates that about half the flux of energetic recoil helium particles will be implanted in the first 2.5 μm-deep layer of the surface. The rest will be implanted as deep as 40 μm. Since the calculated profile is significantly different from the one obtained from bombardment with a monoenergetic helium particle beam, use of multi-energy beams or irradiation of helium-filled capsules in the core of a fast breeder reactor are recommended to assess the possible effects of the neutron-induced helium implantation.

60665 **Corrosion and compatibility considerations of liquid metals for fusion reactor applications.** Tortorelli, P.F. (Oak Ridge National Lab., TN (USA)); Chopra, O.K. (Argonne National Lab., IL (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 621-632(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The current understanding of corrosion and environmental effects on the integrity and mechanical properties of structural materials used with liquid metals in fusion reactors in reviewed. Corrosion processes in liquid lithium systems are examined and their influence on material degradation is discussed. Compatibility considerations that might arise from use of molten lead, bismuth, lead-bismuth, or lead-lithium are reviewed relative to the possible use of these liquids in fusion reactors.

60666 **Effect of nickel concentration on the mass transfer of Fe-Ni-Cr alloys in lithium.** Tortorelli, P.F.; DeVan, J.H. (Oak Ridge National Lab., TN (USA). Metals and Ceramics Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 633-638(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Corrosion and mass transfer of selected Fe-Ni-Cr alloys between 500°C and about 300°C in slowly moving lithium (approx. equal to15 mm/s) were studied in thermal-convection loops. The corrosion rates in the dissolution zones of these loops increased with the nickel concentrations of the respective alloys. All the alloys exhibited porous near-surface layers that were depleted in nickel. The greater weight loss of a 30 wt% Ni alloy relative to a 24 wt% Ni alloy could be correlated with a higher volume fraction of porosity, suggesting that the higher the starting nickel content of the alloy, the greater the volume of nickel removed from the alloy by the lithium. The results from this study indicate that higher nickel levels in Fe-Ni-Cr alloys will pose significant corrosion problems in lithium circuits operating at or above 500°C.

60667 **Study of type 304 stainless steel containment tubing from a lithium test loop.** Bagnall, C. (Westinghouse Electric Corp., Madison, PA (USA). Advanced Reactors Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 639-644(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The present investigation was undertaken in an attempt to learn more about the characteristics of lithium corrosion. This paper deals with a metallographic evaluation of the type 304 stainless steel (T304SS) 2.5 cm diameter tubing, used for the main loop containment of an experimental lithium facility, and gives a detailed account of hot leg corrosion. This examination, while necessarily qualitative from a corrosion standpoint, was aimed at revealing the nature and degree of attack, the effects of down-stream position in an isothermal zone, and the reaction of the liquid metal at welds and weld heat-affected zones.

60668 **Effects of lithium environment on the fatigue properties of ferritic and austenitic steels.** Chopra, O.K.; Smith, D.L. (Argonne National Lab., IL (USA). Materials Science Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 651-656(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Low-cycle fatigue data have been obtained on HT-9 alloy and Type 304 stainless steel at 755 K in a flowing lithium environment of controlled purity. The results show that the fatigue properties of these materials are strongly influenced by the concentration of nitrogen in lithium. For HT-9 alloy, the fatigue life in lithium containing 1000-1500 wppm nitrogen is a factor of 2 to 5 lower than that in lithium with 100-200 wppm nitrogen. The reduction in fatigue life in high-nitrogen lithium can be attributed to internal corrosive attack of the material. The specimens tested in high-nitrogen lithium show considerable surface corrosion, internal corrosive attack, secondary cracks, and partial intergranular fracture mode. This behavior is not observed in specimens tested either in low-nitrogen lithium or a sodium environment.

60669 **Recent results on the gettering of tritium from molten lithium.** Talbot, J.B.; Fisher, P.W.; Clinton, S.D. (Oak Ridge National Lab., TN (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 681-686(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Recent sorption experiments confirm that the mass transfer resistance in the yttrium solid phase controls the rate of tritium uptake from liquid lithium. Physical and chemical characteristics of different yttrium sorbers were measured to identify those properties that have the greatest effect on the tritium recovery rate. The BET surface areas of the five samples tested ranged from 0.005 to 0.4 m^2/g; concentrations of carbon, hydrogen, nitrogen, and oxygen impurities in the sample lots increased with increasing surface area. The sample showing the highest effective sorption rate had the largest surface area but also contained the highest concentration of impurities.

60670 **Ceramic and organic insulators for fusion applications.** Clinard, F.W. Jr.; Hurley, G.F. (Los Alamos National Lab., NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 705-716(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Fusion insulator requirements, operating conditions, and anticipated performance of candidate materials are reviewed, with emphasis on recent developments. Critical problem areas are highlighted, and research and development activities needed to meet the demands of advanced fusion devices are identified.

60671 **Mechanical strength of low-temperature-irradiated polyamides. A five-to-tenfold improvement in dose-resistance over epoxies.** Coltman, R.R. Jr.; Klabunde, C.E. (Oak Ridge National Lab., TN (USA). Solid State Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 717-722(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Neutronics calculations by Engholm [1] show that without additional shielding even the first fusion test reactors such as the Fusion Engineering Device may produce lifetime doses at magnet insulator locations that exceed the radiation tolerance of glass-fabric-filled (gff) epoxies now used. They explore the possible use of an alternative insulator, the mechanical strength of pure and recently available gff polyimides was studied as a function of gamma-ray irradiation at 4.9 K to 100 MGy (10^{10} rads). After a postirradiation anneal at 307 K the flexure and compressive strength of the gff materials measured at 77 K were reduced by up to 40% for 100 MGy while the pure material changed little. Testing done at 300 K gave similar results, but all stress values were about 40% less. Compared to earlier expoxy studies [2] we find that, overall, the gff polyimides are 5 to 10 times more radiation resistant than comparably prepared gff epoxies.

60672 **Irradiation studies of magnet insulator materials.** Schmunk, R.E.; Imel, G.R.; Harker, Y.D. (EG and G Idaho, Inc., Idaho Falls (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 723-728(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Recent magnet insulator studies at the Idaho National Engineering Laboratory have included work applicable to quite different magnet configurations, both the conventional wrapped conductor and the Bitter plate. These investigations have emphasized irradiation effects work in support of the Princeton Plasma Physics Laboratory (PPPL) for the Tokamak Fusion Test Reactor (TFTR) and of Massachusetts Institute of Technology (MIT) for the ZEPHYR program. Postirradiation testing included shear bond testing of specimens prepared at Princeton and compressive fatigue tests of fiberglass-expoxy disks, principally G-10, for MIT. The fatigue tests included both room temperature and liquid nitrogen temperature over a range of maximum loads. The method for determining disk failure during the fatigue test is emphasized in this report.

60673 **Radiation damage in the copper stabilizer in a superconducting magnet.** Nygren, R.E. (Westinghouse Hanford Co., Richland, WA (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 735-738(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

This paper is a general review of the factors that affect the resistivity of a copper stabilizer in a superconducting coil for an advanced (D-T) fusion device. Currently the biggest uncertainties in specifying the amount of copper in a given cross section of conductor are (1) the radiation induced resistivity in copper that has a processing history prototypic of the fabrication of large superconducting coils and (2) the amount of recovery that results from repeated annealing of prototypic material after interim exposures to neutron irradiation at 4.2 K.

60674 **Fusion neutron damage in superconductors and magnet stabilizers.** Van Konynenburg, R.A.; Guinan, M.W.; Kinney, J.H. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Journal of Nuclear Materials;* **103**: No. 1-3, 739-744(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Two NbTi and two Cu wires were irradiated with 14.8 MeV neutrons at 4.2 K to fluences of 6-8 x 10^{20} n/m^2, using RTNS-II. Electrical resistances of Cu were monitored during irradiation. Magnetoresistances were measured in fields up to 12.4 T before and after irradiation and after isochronal annealing up to 273 K. Critical currents of NbTi were measured after irradiation, in fields up to 10 T. The initial rate of increase of resistivity of the Cu was found to be 2.23 x 10^{-31} $(\Omega\text{-m})/(n/m^2)$. This rate could be predicted from fission reactor irradiations using damage energy scaling. The maximum observed change in the NbTi critical current was a decrease of 3% at 4 T. At 6, 8, and 10 T there were no significant changes.

60675 **Materials for vacuum seals and dielectric breaks in near term and commercial reactor designs.** Wille, G.W.; Trachsel, C.A. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 783-788(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Evaluations have been made of currently available sealing materials and concepts and their potential applicability to fusion reactor devices. The environments imposed on seals for fusion reactors are more severe than most applications. Elastomeric, metal, and welded seals were evaluated. Elastomeric materials are not effective for use at radiation dose levels greater than 10^8 rads; the best are polyurethane or ehtylene propylene. Welded seals and metal seals offer the advantage of realiability once a seal is made but lack the case of use inherent in elastomer seals. The sealing of a fusion reactor vacuum chamber is a non-trivial matter and will require R and D on a multitude of design options.

60676 (INIS-mf—7127, pp vp) **Collective non-equilibrium models in plasma-solid material interactions (PMI).** Khait, Y.L. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Physics). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

60677 (INIS-mf—7127, pp vp) **Coatings for fusion reactor applications.** Mattox, D.M.; Mullendore, A.W.; Whitley, J.B. (Sandia National Labs., Albuquerque, NM (USA)). [nd]. Dep. NTIS (US Sales Only).

From Workshop on plasma chemistry in technology; Ashkelon, Israel (30 Mar 1981).

99 GENERAL AND MISCELLANEOUS

60678 **(SAND—82-0636C) Strypi VII R launch vehicle.** Wente, H.A. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-821017—3). NTIS, PC A02/MF A01. Order Number DE82019486.

From 6. AIAA sounding rocket conference; Orlando, FL, USA (26 Oct 1982).

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The Strypi VII R is a three-stage solid propellant launch vehicle designed to boost payloads ranging from 50 to 300 pounds to re-entry environment conditions. The first stage, a fin-stabilized ballistic rocket boosts the final two stages into an exoatmospheric trajectory where an attitude control system (ACS) precesses the spinning stages into the re-entry attitude. The ACS section is then jettisoned, and ignition of the spin-stabilized upper stages is initiated at a time determined to provide a zero angle-of-attack at beginning of re-entry. Four vehicles have been flown carrying three different re-entry test vehicles. Originally designed for use with a Castor II motor, the highly aluminized propellant in the first stage spinning environment contributed to a case rupture resulting in failure of the second flight. The last two flights were flown successfully using Castor I motors. Typically, the Strypi VII R can boost a 100 lbm RV to a speed of 19,500 fps on a flight path of -30 degrees at 300,000 feet altitude.

9901 Management

REFER ALSO TO CITATION(S) 59949

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 59145, 59826, 59846, 59921, 60085, 60501, 60515

60679 **(ANL—82-37) Software for estimating sparse Jacobian matrices.** Coleman, T.F.; More, J.J. (Argonne National Lab., IL (USA)). Jul 1982. Contract W-31-109-ENG-38. 59p. NTIS, PC A04/MF A01. Order Number DE82021234.

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In many nonlinear problems it is necessary to estimate the Jacobian matrix of a nonlinear mapping F. In large scale problems the Jacobian of F is usually sparse, and then estimation by differences is attractive because the number of differences can be small compared to the dimension of the problem. For example, if the Jacobian matrix is banded then the number of differences needed to estimate the Jacobian matrix is, at most, the width of the band. In this paper we describe a set of subroutines whose purpose is to estimate the Jacobian matrix of a mapping F with the least possible number of function evaluations.

60680 **(CONF-810842—5) Maximal posterior probability error localization.** Liepins, G.E.; Pack, D.J. (Oak Ridge National Lab., TN (USA); Union Carbide Corp., Oak Ridge, TN (USA). Computer Sciences Div.). 1981. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE82020928.

From American Statistical Association meeting; Detroit, MI, USA (10 Aug 1981).

Given a data base and a system of intervariable constraints that acceptable data records are required to satisfy, it is of interest to determine the specific combination of incorrect components in each failing record. The determination of the components is error localization and it is shown that in theory the statistically optimal means of error localization is maximal posterior probability error location (MPPEL). Properties of MPPEL are stated, and connections to minimal fields to impute (MFI), minimal weighted fields to impute (MWFI), and maximal prior probability error localization are made. Simulation results are presented. The tentative conclusion is suggested that for practical application, MPPEL is not significantly superior to MFI.

60681 **(CONF-820737—1) Moment series for moment estimators of the parameters of a Weibull density.** Bowman, K.O.; Shenton, L.R. (Union Carbide Corp., Oak Ridge, TN (USA). Computer Sciences Div.; Georgia Univ., Athens (USA)). 1982. Contract W-7405-ENG-26. 49p. NTIS, PC A03/MF A01. Order Number DE82018265.

From 14. annual symposium on the interface Rensselaer Polytechnic Institute on computer science and statistics; Troy, NY, USA (6 Jul 1982).

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Taylor series for the first four moments of the coefficients of variation in sampling from a 2-parameter Weibull density are given: they are taken as far as the coefficient of n^{-24}. From these a four moment approximating distribution is set up using summatory techniques on the series. The shape parameter is treated in a similar way, but here the moment equations are no longer explicit estimators, and terms only as far as those in n^{-12} are given. The validity of assessed moments and percentiles of the approximating distributions is studied. Consideration is also given to properties of the moment estimator for 1/c.

60682 **(CONF-820810—11) Using the method-of-lines technique to solve initial-boundary-value partial differential equations.** Gaffney, P.W. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE82020909.

From 10. international mathematics and computers simulation congress on systems simulation and scientific computation; Montreal, Canada (9 Aug 1982).

Portions of document are illegible.

The purpose of this paper is to outline some of the disadvantages of the numerical method of lines technique for solving initial boundary value partial differential equations. FORTRAN codes which implement this technique will be reviewed in the context of their application to practical problems. Particular emphasis will be given to numerical software that is suitable for solving the initial value ordinary differential equations which result from applying this method to realistic problems.

60683 **(DOE/ER/02383—0085) Computational methods and software for ODES and their applications. Annual progress report, November 16, 1981-November 15, 1982.** Gear, C.W. (Illinois Univ., Urbana (USA). Dept. of Computer Science). 1982. Contract AC02-76ER02383. 12p. (COO—2383-0085). NTIS, PC A02/MF A01. Order Number DE82020803.

Tasks in the development of programs for the solution at ordinary differential equations are described and work performed is described. (GHT)

60684 (INIS-mf—6937, pp vp) **Optimal application of the recursive Monte Carlo method in multigroup problems.** Goldstein, M. (Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60685 (INIS-mf—6937, pp vp) **Optimization of splitting in Monte Carlo calculations.** Dubi, A.; Elperin, T. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering). 1980. Dep. NTIS (US Sales Only).

From Israel Nuclear Societies joint annual meeting; Beershaba, Israel (4 Dec 1980).

60686 **(LA—9353-M) SUBMAP manual: subroutine mapping program.** Berardo, P.A.; Swenson, B.C. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01. Order Number DE82021836.

SUBMAP is FORTRAN computer program for analyzing FORTRAN source files. It identifies the names and types of routines, and the names and references for common blocks. A tree-type listing can be generated showing the hierarchy and sequence of references starting and ending with any routine. Many other analysis options exist to summarize or extract cross-reference information, extract source code for selected routines, or reorder the source file in alphabetical or call order. SUBMAP can be used interactively or in batch mode with dynamic selection of source, input, output, and save files.

60687 **(LA-UR—82-1708) Historical perspective of mass storage.** Worlton, J. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-821014—1). NTIS, PC A02/MF A01. Order Number DE82018376.

From 5. IEEE symposium on mass storage system; Denver, CO, USA (15 Oct 1982).

The need to store information is older than civilization itself. Primitive peoples recorded information about their lives, activities, and environment as early as the Paleolithic Era, and some of these records are still extant. Beginning with these records, this paper will review some of the symbolisms, media, and tools used for recording information through the major ages of technology, with emphasis on the very early history of the recording of information.

60688 **(LA-UR—82-1893) Aspects of model selection in multivariate analyses.** Picard, R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 15p. (CONF-821021—1). NTIS, PC A02/MF A01. Order Number DE82019576.

From DOE statistical symposium; Idaho Falls, ID, USA (1 Oct 1982).

Analysis of data sets that involve large numbers of variables usually entails some type of model fitting and data reduction. In regression problems, a fitted model that is obtained by a selection process can be difficult to evaluate because of optimism induced by the choice mechanism. Problems in areas such as discriminant analysis, calibration, and the like often lead to similar difficulties. The preceeding sections reviewed some of the general ideas behind assessment of regression-type predictors and illustrated how they can be easily incorporated into a standard data analysis.

60689 **(LA-UR—82-2059) Experiences with distributing graphic software between processors.** Hamlin, G.; George, J.E. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 8p. (CONF-821002—2). NTIS, PC A02/MF A01. Order Number DE82019559.

From 3. international conference on distributed computing systems; Miami, FL, USA (18 Oct 1982).

Software to aid the distribution and coordination of tasks between different processors was developed to distribute applications written in Fortran. This development led to the discovery of problems unique to Fortran and to interesting practical solutions. Two graphical applications were distributed to a variety of machines and machine pairs: CDC 7600-LSI/11, Cray-LSI/11, VAX 11/780, and Apollo. These distributions pointed out several parameters such as the use of Fortran Common, communication parameters, and processing capabilities that can affect the successful distribution of applications.

60690 **(LA-UR—82-2326) Implementation of a fully reconfigurable multimicroprocessor.** Trujillo, V.A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 4p. (CONF-820908—3). NTIS, PC A02/MF A01. Order Number DE82021769.

From IEEE conference on circuits and computers; New York, NY, USA (29 Sep 1982).

The fully reconfigurable multimicroprocessor is an experimental configuration designed specifically as a research tool for implementing and evaluating parallel-processing algorithms on various multiprocessor architectures. Basically, the system is a shared-memory MIMD (multiple instruction-multiple data stream) machine that supports reconfiguration between processor and memory nodes to permit experimentation on architectures sharing common memory, networks of processors with only local memory, etc. This experimental computer system is currently under development within the Computing Division at the Los Alamos National Laboratory.

60691 **(LBL—14763) File migration in distributed computer systems.** Porcar, J.M. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 159p. NTIS, PC A08/MF A01. Order Number DE82021572.

Portions of document are illegible. Thesis.

The management of global (shared) files can have a big impact on the performance of distributed computer systems. In this dissertation effort is devoted to the study of the file referencing process and to the development of algorithms to place and migrate files in distributed computer systems. The topic of assigning files to the nodes of computer networks has received considerable attention in the past. Unfortunately, most of the work in this area has concentrated on the optimization of distributed file systems based on extremely simple models of the workload. This study is based on traces of activity collected from a number of real systems. The workload could be analyzed and algorithms adapted to it. Synthetic distributed systems were obtained from the real centralized systems that generated the traces. The SLAC and the Hughes systems were used. This partitioning of the users of a large centralized computer system into a number of smaller user communities was based on their utilization of shared files. The SLAC system was found to produce user subsets with a higher degree of overlapping (in terms of shared files) than the Hughes Aircraft installation. The file migration policies are introduced. First the single copy policies are presented. In this context a migration policy was developed that is optimal in the sense of minimizing the average network traffic. The existence of extended localities in the use of shared files suggested the use of multiple-copy policies in order to reduce the network traffic even further. A number of policies based on the Working Set model were studied. The best performing policies in terms of generated traffic are those that closely monitor the update traffic and that react to it by deleting the copies that are too expensive to maintain up to date.

60692 **(LBL—14771) Portability issues in the design of distributed applications: a portable, electronic-mail system.** Sventek, J.S. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 8p. (CONF-820938—1). NTIS, PC A02/MF A01. Order Number DE82020312.

From IEEE fall computer conference; Washington, DC, USA (21 Sep 1982).

The effects of virtual machine concepts on the design and implementation of distributed applications are explored. After outlining the critical features of such an approach, a test case of an electronic mail system is described. The results of the experiment are summarized and future directions of this work are outlined.

60693 **(ORNL/CSD—105) Mathematics and Statistics Research Department progress report, period ending June 30, 1982.** Denson, M.V.; Funderlic, R.E.; Gosslee, D.G.; Lever, W.E. (comps.). (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 119p. NTIS, PC A06/MF A01. Order Number DE82021531.

This report is the twenty-fifth in the series of progress reports of the Mathematics and Statistics Research Department of the Computer Sciences Division, Union Carbide Corporation Nuclear Division (UCC-ND). Part A records research progress in analysis of large data sets, biometrics research, computational statistics, materials science applications, moving boundary problems, numerical linear algebra, and risk analysis. Collaboration and consulting with others throughout the UCC-ND complex are recorded in Part B. Included are sections on biology, chemistry, energy, engineering, environmental sciences, health and safety, materials science, safeguards, surveys, and the waste storage program. Part C summarizes the various educational activities in which the staff was engaged. Part D lists the presentations of research results, and Part E records the staff's other professional activities during the report period.

60694 **(SAND—82-1584) Effect of changing step size on the accuracy of multistep formulas.** Shampine, L.F. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1982. Contract AC04-76DP00789. 17p. NTIS, PC A02/MF A01. Order Number DE82020884.

We are concerned with the numerical solution of the initial value problem for a system of ordinary differential equations, $y' = dy/dx = f(x,y)$ $a \leqq x \leqq b$, $y(a)$ given, by discrete variable formulas. Such formulas approximate the solution $y(x)$ at points x/sub m/ by y/sub m/ = y(x/sub m/). Having computed approximations at a $= x_0 < x_1 < \ldots <$ x/sub n/, codes based on such formulas seek to approximate y(x) at x/sub n+1/ = x/sub n/ + h/sub n+1/, i.e., to advance the numerical solution one step of step size h/sub n+1/ in the direction of b. Some measure of the error of this approximation is estimated by the quantity est and it is compared to an accuracy requirement, (est) $\leqq \epsilon$, specified by the user of the code. If the test is not passed, the approximation y/sub n+1/ is rejected and another approximation sought at a new x/sub n+1/ closer to x/sub n/, i.e., h/sub n+1/ is reduced. If the test is passed, the code selects the next step size h/sub n+2/ with the object of using an efficiently large step size and still satisfying the requirement.

60695 **(SAND—82-1908C) Some remarks on the Herlestam-Johannesson algorithm for computing logarithms over GF(2/sup P/).** Brickell, E.F.; Moore, J.H. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 5p. (CONF-820852—2). NTIS, PC A02/MF A01. Order Number DE82020628.

From Conference on cryptosystems; Santa Barbara, CA, USA (23 Aug 1982).

At the 1981 IEEE Symposium on Information Theory, T. Herlestam and R. Johannesson presented a heurestic method for computing logarithms over GF(2/sup p/). They reported computing logarithms over $GF(2^{31})$ with surprisingly few iterations and claimed that the running time of their algorithm was polynomial in p. If this were true, the algorithm could be used to cryptanalyze the Pohlig-Hellman cryptosystem, currently in use by Mitre Corporation for key distribution. The Mitre system operates in $GF(2^{127})$. However, the algorithm was not implemented for GF(2/sup p/) for $p > 31$ because it would require multiple precision arithmetic. Consequently attempts to evaluate the possible threat to the Pohlig-Hellman cryptosystem have centered on modeling the algorithm so that some predictions could be made analytically about the number of iterations required to find logarithms over GF(2/sup p/) for $p > 31$.

60696 **(SAND—82-8006) Design and operation of an equipment interface for recording data onto serial devices.** Hopwood, J.E. (Sandia National Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 24p. NTIS, PC A02/MF A01. Order Number DE82021706.

Portions of document are illegible.

This report describes the design and operation of an interface equipment for receiving digital data from a precision, commercial, two-axis coordinate digitizer. The equipment then processes and transmits these data to character-serial recording devices (a minifloppy disk recorder, a display terminal, and a computer).

60697 **(SAND—82-8231) AIM: the analytically integrated magnus method for linear and second-order sensitivity coefficients.** Kramer, M.A.; Calo, J.M.; Rabitz, H.; Kee, R.J. (Sandia Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 30p. NTIS, PC A03/MF A01. Order Number DE82020887.

Aim is a computer code for sensitivity analysis of ordinary differential equations. The code, an implementation of the Analytically Integrated Magnus (AIM) method, can calculate both first- and second-order sensitivity coefficients. A small amount of programming is required, and a basic knowledge of FORTRAN is assumed.

60698 **(UCID—19488) Effects of unequal input/output sampling rates on the identification of electromagnetic-transient systems.** Bogdan, E.J.; Clark, G.A. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. 115p. NTIS, PC A06/MF A01. Order Number DE82021685.

Portions of document are illegible.

Some limitations on the identification of electromagnetic systems based on input and output data of different record lengths and sampling rates are discussed. This problem has come to attention when trying to process internal data for the A-7E A-7E scale model in the Large Scale Model Measurement Program. The problems arise due to limitations of the measurement equipment and computer algorithms used to process the data. Because the input and output records must have the same sampling rates to be processed, considerable data preprocessing must be done to ensure that this condition exists. Three such preprocessing methods are included for comparison, demonstrated with examples, and the second one is concluded to be preferred for general use. Included are examples of the identification of a system model for each of the above three cases, along with a brief discussion of each. Brief mention is made of the importance of proper windowing of truncated data sequences in order to obtain correct Fourier transforms using the DFT (discrete Fourier transform). Examples demonstrate the importance of windowing properly.

60699 **(UCRL—87474) Mathematical definition of protocol translation.** Ong, M.M. (Lawrence Livermore National Lab., CA (USA)). 26 Mar 1982. Contract W-7405-ENG-48. 10p. (CONF-821006—2). NTIS, PC A02/MF A01. Order Number DE82015188.

From 7. conference on local computer networks; Minneapolis, MN, USA (12 Oct 1982).

This paper mathematically defines protocol translation which is a function employed to interconnect different computer networks. An example of an application is a gateway.

60700 **(UCRL—87795) Minimization of path lengths in single stage connection networks.** Wirsching, J.E.; Kishi, T. (Lawrence Livermore National Lab., CA (USA)). 1982. Contract W-7405-ENG-48. 12p. (CONF-821002—3). NTIS, PC A02/MF A01. Order Number DE82020174.

From 3. international conference on distributed computing systems; Miami, FL, USA (18 Oct 1982).

The question is analyzed as to whether various connectivities within multiple-stage or single-stage connection networks are equivalent. Conditions under which the CN's are configured and exercised are precisely defined. Members of the universe of single-stage CN's are discovered to be non-equivalent and reasons for this are examined. Rules are developed for minimization of path lengths, and measurements are made for a number of different connectivities in both the static and dynamic states. Multiple-stage CN's are all found to be equivalent under random request loading and random arbitration. A comparison of the two types of CN's is attempted.

60701 **(UCRL—87971) Some programming aspects of quantum Monte Carlo calculations.** Alder, B.J.; Ceperley, D.M. (Lawrence Livermore National Lab., CA (USA)). 28 Jul 1981. Contract W-7405-ENG-48. 8p. (CONF-820844—1). NTIS, PC A02/MF A01. Order Number DE82020166.

From Cyber 205 applications symposium; Ft Collins, CO, USA (12 Aug 1982).

The Monte Carlo method is a powerful scheme to solve many mathematical equations and is in fact, made practical only through high speed computers, particularly for those physical problems that are of high dimensionality. Alternative numerical schemes of spanning high dimensional spaces uniformly with a grid, increase in computational time exponentially with the dimensionality and thus became rapidly impractical as the dimensionality increases. The key to success of a Monte Carlo scheme is that it samples the space selectively, not with some uniform random distribution but where it matters most, by a probability density called an importance function. Furthermore, the Monte Carlo scheme is well adapted to computers since it consists of a simple, highly repetitive algorithm that takes advantage of the fast arithmetic capabilities of the machines. Consideration of how to arrange such calculations efficiently on various machines of different architecture is discussed.

60702 **(UIUCDCS-R—82-1086) Differential/algebraic systems and matrix pencils.** Gear, C.W.; Petzold, L.R. (Illinois Univ., Urbana (USA). Dept. of Computer Science). Apr 1982. Contract AC02-76ER02383. 28p. (COO—2383-0083; UILU-ENG—82-1707; CONF-820388—1). NTIS, PC A03/MF A01. Order Number DE82020138.

From Conference on Matrix Pencils; Pitea, Sweden (1 Mar 1982).

In this paper we study the numerical solution of the differential/algebraic systems $F(t, y, y') = 0$. Many of these systems can be solved conveniently and economically using a range of ODE methods. Others can be solved only by a small subset of ODE methods, and still others present insurmountable difficulty for all current ODE methods. We examine the first two groups of problems and indicate which methods we believe to be best for them. Then we explore the properties of the third group which cause the methods to fail. The important factor which determines the solvability of systems of linear problems is a quantity called the global nilpotency. This differs from the usual nilpotency for matrix pencils when the problem is time dependent, so that techniques based on matrix transformations are unlikely to be successful.

9903 Information Handling

60703 **(DOE/TIC—4581-R4) DOE energy information data base: magnetic tape description.** Kawakami, N. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Jun 1980. 22p. NTIS, PC A02/MF A01.

The Technical Information Center as part of its activities in the management, publication, and dissemination of scientific and technical information receives and disseminates magnetic tapes containing bibliographic information pertaining to research and development in all areas of energy. The tape format used by TIC conforms to American Standard Z39.2-1971 and is described in this publication.

60704 (INIS-mf—7042, pp v) **Czechoslovakia's participation in IAEA's INIS/AGRIS direct access experiment.** Stanik, Z. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The task of establishing direct access to the INIS data base is being implemented in Czechoslovakia by the Nuclear Information Centre in Prague-Zbraslav. The aim and meaning of the experiment is to build a Czechoslovak network of terminals linked to the IAEA with the possibility of future connections to other data bases. The first stage is characterized by the use of a dial-up line.

60705 (INIS-mf—7042, pp v) **Czechoslovakia's participation in the INIS system.** Kakos, A. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The development of the Czechoslovak participation in the INIS system is described. A detailed description is presented of the methods and technology of document processing within the INIS scope by the Czechoslovak Nuclear Information Centre.

60706 (INIS-mf—7042, pp v) **Magnetic tape-based INIS-SDI information retrieval service in Czechoslovakia.** Blazek, J. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The activities are described of the SDI department of the Czechoslovak Nuclear Information Centre. It performs retrospective and current searches to order. Statistical data are given on the amount and quality of output.

60707 (INIS-mf—7042, pp v) **Experience with the INIS system in the GDR.** Scheel, C. (Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin (German Democratic Republic)). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The establishment and activities of the INIS centre in the GDR are described, i.e., the processing of documents, the methods used to keep the delay between the publication of a document and its inclusion in INIS as short as possible and the ways in which the output is used by information users.

60708 (INIS-mf—7042, pp v) **Poland's participation in and use of the INIS system.** Sokalski, A. (Energetics and Atomic Energy Information Centre, Warsaw (Poland)). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

The activities of the Polish nuclear information centre since it joined the INIS system to date are described. Data are given on the amount and quality of the input to the INIS data base and on the use of INIS output.

60709 (INIS-mf—7042, pp v) **Cooperation of CMEA countries in information servicing of peaceful uses of nuclear energy and the Czechoslovak Nuclear Information Centre.** Nadvornik, M. (Ceskoslovenska Komise pro Atomovou Energii, Zbraslav nad Vltavou. Ustredni Informacni Stredisko pro Jaderny Program). 1980. (In Russian). NTIS (US Sales Only), PC A07/MF A01.

From Conference on topics in information on nuclear science and technology; Prague, Czechoslovakia (26 Jul 1979).

A survey is given of the activities and tasks of the Nuclear Information Centre within Czechoslovakia and its cooperation with the other CMEA countries. The trends and prospects are indicated of the development of cooperation with the main information centres of other countries.

60710 **(LBL—12353) Compression technique for large statistical data bases.** Eggers, S.J.; Olken, F.; Shoshani, A. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract AC03-76SF00098. 24p. (CONF-810993—3). NTIS, PC A02/MF A01. Order Number DE82020550.

From 7. conference on very large databases; Cannes, France (9 Sep 1981).

The compression of large statistical databases is explored and are proposed for organizing the compressed data, such that the time required to access the data is logarithmic. The techniques exploit special characteristics of statistical databases, namely, variation in the space required for the natural encoding of integer attributes, a prevalence of a few repeating values or constants, and the clustering of both data of the same length and constants in long, separate series. The techniques are variations of run-length encoding, in which modified run-lengths for the series are extracted from the data stream and stored in a header, which is used to form the base level of a B-tree index into the database. The run-lengths are cumulative, and therefore the access time of the data is logarithmic in the size of the header. The details of the compression scheme and its implementation are discussed, several special cases are presented, and an analysis is given of the relative performance of the various versions.

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The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

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51561	*See* NUREG/CR-2827		MN -78	7:59554
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5017	NTIS (US Sales Only), MF A0103/MF A01	DE82702356	MN -41	7:59501
5739	NTIS (US Sales Only), MF A0102/MF A01	DE82702355	MN -48	7:60233
5887	NTIS (US Sales Only), MF A0102/MF A01	DE82702393	MN -78	7:59484
5902	NTIS (US Sales Only), MF A0102/MF A01		MN -34A	7:59757
5908	NTIS (US Sales Only), MF A0102/MF A01	DE82702974	MN -25	7:59710
5909	NTIS (US Sales Only), MF A0102/MF A01	DE82702388	MN -80	7:59502
5910	NTIS (US Sales Only), MF A0103/MF A01	DE82702396	MN -79	7:59503
5912	NTIS (US Sales Only), MF A0103/MF A01	DE82702391	MN -80	7:59535
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5924	NTIS (US Sales Only), MF A0102/MF A01	DE82702368	MN -38	7:59558
5938	NTIS (US Sales Only), MF A0102/MF A01	DE82702367	MN -23	7:60215
5965	NTIS (US Sales Only), MF A0102/MF A01	DE82702369	MN -38	7:59941
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5984	NTIS (US Sales Only), MF A0102/MF A01	DE82702364	MN -22	7:59842
5993	NTIS (US Sales Only), MF A0102/MF A01	DE82702357	MN -41	7:59569
5995	NTIS (US Sales Only), MF A0102/MF A01	DE82702358	MN -41	7:59570
6007	NTIS (US Sales Only), MF A0102/MF A01	DE82702382	MN -25	7:59947
6010	NTIS (US Sales Only), MF A0102/MF A01	DE82702386	MN -80	7:59536
6013	NTIS (US Sales Only), MF A0102/MF A01	DE82702359	MN -41	7:59571
6014	NTIS (US Sales Only), MF A0102/MF A01	DE82702399	MN -79	7:59506
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6016	NTIS (US Sales Only), MF A0102/MF A01	DE82702401	MN -79	7:59572
6017	NTIS (US Sales Only), MF A0102/MF A01	DE82702402	MN -79	7:59573
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2683-2	CEN Saclay, Service de Documentation, 91191 Gif-sur-Yvette Cedex (France)		ND -20	7:60519
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81-82DEN-RNM-1	*See* PB-82-199027			7:59180
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81-P-1304	NTIS (US Sales Only), MF A0102/MF A01		MN -34D	7:60343
CONF-790282-	(17. winter school on hyperfine interactions, Bielsko-Baila, Poland, 19 Feb-2 Mar 1979)			
	See INP-1066/PL	DE82780636	MN -34A	7:59738
CONF-791177-	(New technologies in the use of peat conference, Bad Zwischenahn, F.R. Germany, 5-8 Nov 1979)			
1	Institute of Gas Technology, 3424 South State St., Chicago, IL 60616			7:59130
CONF-791205-	(ASME winter annual meeting, New York, NY, USA, 2-7 Dec 1979)			
	Am. Soc. Mech. Eng., [Pap.], No. 79-WA/SOL-29, vp(1979)			7:59373
	Am. Soc. Mech. Eng., [Pap.], No. 79-WA/HT-38, vp(1979)			7:59375

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CONF-800544-	(Electrochemical Society meeting, St Louis, MO, USA, 11-16 May 1980)			
4	*See* SERI/TP-611-848	DE82021747	MN -63	7:59367
CONF-8009280-	(2. western hemisphere energy symposium, Rio de Janeiro, Brazil, 22-26 Sep 1980)			
Summ.	*See* MTP-80W00010		ND -13	7:59657
CONF-801103-	(IEEE nuclear science symposium, Orlando, FL, USA, 5-7 Nov 1980)			
68	NTIS, PC A02/MF A01	DE82017065	MN -2	7:60079
CONF-801115-	(6. international symposium on packaging and transporting radioactive material, Berlin, F.R. Germany, 10 Nov 1980)			
46	*See* CEA-CONF-6060	DE82702375	MN -71	7:59909
CONF-8012103-	(Workshop on high energy nuclear studies at KEK, Oho, Ibaraki, Japan, 16-18 Dec 1980)			
	See KEK-80-14	DE82780635	MN -34D	7:60348
CONF-810153-	(2. special symposium on natural radiation environment, Bombay, India, 19-23 Jan 1981)			
2	*See* LBL-10775	DE82020291	MN -11	7:60167
CONF-810286-	(Energy policy in perspective - solutions, problems, and prospects symposium, Austin, TX, USA, 12-13 Feb 1981)			
	University of Texas at Austin, Lyndon B. Johnson School of Public Affairs, Austin, TX 78712			7:59653
CONF-810307-	(3. specialist meeting on transient two-phase flow, Pasadena, CA, USA, 23-25 Mar 1981)			
5	*See* CEA-CONF-5965	DE82702369	MN -38	7:59941
CONF-810369-	(International seminar on physical chemistry of liquid metals, Karlsruhe, F.R. Germany, 24-26 Mar 1981)			
2	*See* CEA-CONF-5909	DE82702388	MN -80	7:59502
4	*See* CEA-CONF-5908	DE82702974	MN -25	7:59710
CONF-810373-	(5. international conference on fracture, Cannes, France, 29 Mar-3 Apr 1981)			
(Vol.1)	Oxford, England; Pergamon Press (1982).			7:59750
(Vol.3)	Oxford, England; Pergamon Press (1982).			7:59751
(Vol.6)	Oxford, England; Pergamon Press (1982).			7:59752
CONF-810375-	(Workshop on the application of the SNS to heavy ion fusion, Abingdon, UK, 23-26 Mar 1981)			
	See RL-81-080	DE82780637	MN -20	7:60362
CONF-8103136-	(Scientific and technical meeting of the French Health Physics Society, Lamanon, France, 25 Mar 1981)			
1	*See* CEA-CONF-6035	DE82702407	MN -37	7:60077
CONF-8104162-	(14. informal meeting on reactor noise, St. Englmar, F.R. Germany, 28-30 Apr 1981)			
1	*See* CEA-CONF-5912	DE82702391	MN -80	7:59535
CONF-8104174-	(Joint Canadian/US symposium on regional issues in energy development: a dialogue of east and west, Boston, MA, USA, 10-11 Apr 1981)			
(Summ.)	University Consortium for Research on North America, 1737 Cambridge St., Cambridge, MA 02138			7:59633
CONF-8105160-	(Seminar on the development of radioprotection techniques for nuclear energy workers, Cadarache, France, 5-7 May 1981)			
1	*See* CEA-CONF-5739	DE82702355	MN -48	7:60233
CONF-8106191-	(NATO AST conference on quantum electrodynamics of strong fields, Lahnstein, F.R. Germany, 15-26 Jun 1981)			
1	*See* RLO-01388-871	DE82020192	MN -34D	7:60359
CONF-8106226-	(Annual meeting of the Deutsche Gesellschaft fuer Metallkunda e.V., Baden-Baden, F.R. Germany, 9-12 Jun 1981)			
(Summ.)	*See* INIS-mf-7070	DE82780681	MN -78	7:59612
CONF-8106228-	(Conference on grand unified theories and related topics, Kyoto, Japan, 29 Jun-3 Jul 1981)			
2	*See* RLO-1388-873	DE82020191	MN -34D	7:60358
CONF-8106230-	(Conference on core design features affecting dynamic behaviour, Rome, Italy, 2-5 Jun 1981)			
1	*See* CEA-CONF-5017	DE82702356	MN -41	7:59501
2	*See* CEA-CONF-5918	DE82702397	MN -79	7:59504
CONF-8106236-	(Specialists meeting on boiling noise detection, Risley, UK, 9-11 Jun 1981)			
1	*See* CEA-CONF-5920	DE82702398	MN -79	7:59505
CONF-8106252-	(7. international conference on medical imaging processing, Stanford, CA, USA, 22-26 Jun 1981)			
1	*See* CEA-CONF-5979	DE82702975	MN -48	7:60216
CONF-810708-	(2. international conference on numerical methods in thermal problems, Venice, Italy, 7-10 Jul 1981)			
4	*See* CEA-CONF-5924	DE82702368	MN -38	7:59558
CONF-810774-	(Summer school on high energy particle accelerators, Batavia, IL, USA, 13-24 Jul 1981)			
	American Institute of Physics, 335 East 45th Street, New York, NY 10017			7:59966
CONF-810801-	(6. international conference on structural mechanics in reactor technology, Paris, France, 17-21 Aug 1981)			
81	*See* CEA-CONF-6013	DE82702359	MN -41	7:59571
82	*See* CEA-CONF-6018	DE82702360	MN -41	7:59574
83	*See* EDF-CONF-81E117698	DE82702362	MN -41	7:60203
84	*See* CEA-CONF-6014	DE82702399	MN -79	7:59506
85	*See* CEA-CONF-6015	DE82702400	MN -79	7:59507

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88	*See* CEA-CONF-6019	DE82702403	MN -79	7:59575
89	*See* CEA-CONF-6020	DE82702404	MN -79	7:59576
90	*See* CEA-CONF-6021	DE82702405	MN -79	7:59508
CONF-810812-	(IECEC conference, Atlanta, GA, USA, 9-14 Aug 1981)			
	Proc., Intersoc. Energy Convers. Eng. Conf., 1: 583-585(1981)			7:59347
CONF-810831-	(Fusion reactor materials meeting, Seattle, WA, USA, 9-12 Aug 1981)			
93	NTIS, PC A02/MF A01	DE82020941	MN -20c	7:60589
94	NTIS, PC A02/MF A01	DE82020940	MN -20c	7:60590
CONF-810839-	(AF/DARPA review of progress in quantitative NDE, Boulder, CO, USA, 2-7 Aug 1981)			
18	NTIS, PC A02/MF A01	DE82020916	MN -97a	7:60130
CONF-810842-	(American Statistical Association meeting, Detroit, MI, USA, 10-13 Aug 1981)			
5	NTIS, PC A02/MF A01	DE82020928	MN -13	7:60680
CONF-810856-	(International conference on the science of hard materials, Moran, WY, USA, 23-28 Aug 1981)			
3	*See* CEA-CONF-5902		MN -34A	7:59757
CONF-810865-	(Solar world forum, Brighton, UK, 23-28 Aug 1981)			
	Oxford, England; Pergamon Press Ltd (1982).			7:59354
CONF-810884-	(Monterey containment symposium, Monterey, CA, USA, 26-28 Aug 1981)			
4	*See* LA-UR-82-2308	DE82021767	MN -11	7:60145
CONF-8108130-	(Symposium IASTED, Cairo, Egypt, 31 Apr-3 Sep 1981)			
1	*See* CEA-CONF-5887	DE82702393	MN -78	7:59484
CONF-810905-	(ANS/ENS topical meeting on probabilistic risk assessment, Post Chester, NY, USA, 20-24 Sep 1981)			
38	*See* CEA-CONF-5993	DE82702357	MN -41	7:59569
39	*See* CEA-CONF-5995	DE82702358	MN -41	7:59570
CONF-810944-	(9. international conference on cyclotrons and their applications, Caen, France, 7-10 Sep 1981)			
10	*See* CEA-CONF-5984	DE82702364	MN -22	7:59842
CONF-810993-	(7. conference on very large databases, Cannes, France, 9-11 Sep 1981)			
3	*See* LBL-12353	DE82020550	MN -32	7:60710
CONF-810996-	(European Society of Nuclear Medicine meeting, Bern, Switzerland, 8-12 Sep 1981)			
2	*See* CEA-CONF-6043	DE82702408	MN -37	7:60217
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CONF-8109134-	(International conference on industrial application of radioisotopes and radiation technology, Grenoble, France, 28 Sep-20 Oct 1981)			
5	*See* CEA-CONF-5938	DE82702367	MN -23	7:60215
CONF-8109169-	(5. international symposium on water column separation, Obernach, F.R. Germany, 28-30 Sep 1981)			
	See CISE-1723			7:59942
CONF-8110141-	(Conference on large body impacts and terrestrial evolution, Snowbird, UT, USA, 18-22 Oct 1981)			
3	*See* LBL-14780	DE82020338	MN -66	7:60293
CONF-8110185-	(AFCET automation congress, Nantes, France, 27-29 Oct 1981)			
1	*See* CEA-CONF-6074	DE82702373	MN -38	7:59910
CONF-8110186-	(Consultant meeting on uranium and plutonium iotope resonance parameters, Vienna, Austria, 28 Sep-2 Oct 1981)			
1	*See* CEA-CONF-6010	DE82702386	MN -80	7:59536
CONF-8110191-	(Information meeting of the French Health Physics Society, Loches, France, 15 Oct 1981)			
1	*See* CEA-CONF-6065	DE82702410	MN -37	7:60078
CONF-8110222-	(Symposium and banquet speeches of the celebration of the 50th anniversary of Lawrence Berkeley Laboratory, Berkeley, CA, USA, 3 Oct 1981)			
1	*See* NP-2906159		MN -34D	7:60357
CONF-811169-	(Eastern oil shale symposium, Lexington, KY, USA, 15-17 Nov 1981)			
	IMMR, Publications Office, PO Box 13015, Lexington, KY 40512			7:59199
CONF-8111103-	(Conference on the study of few body systems with electromagnetic probes, Amsterdam, Netherlands, 19-20 Nov 1981)			
	See INIS-mf-7123	DE82780627	MN -34D	7:60361
CONF-811203-	(2. workshop on hot electron ring physics, San Diego, CA, USA, 1-3 Dec 1981)			
Vol.1	NTIS, PC A21/MF A01	DE82016600	MN -20	7:60520
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CONF-811215-	(World conference on neutron radiography, San Diego, CA, USA, 7-10 Dec 1981)			
10	*See* LBL-14714	DE82020294	MN -37	7:60138
CONF-820116-	(National seminar on non-destructive testing, Paris, France, 26-28 Jan 1982)			
1	*See* EIR-341			7:59559
CONF-820154-	(Society of Civil Engineers conference on geotechnics of waste management, Philadelphia, PA, USA, 19 Jan 1982)			
1	*See* UCRL-86582	DE82020176	MN -70	7:59312

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CONF-820205-	(111. AIME annual meeting, Dallas, TX, USA, 1 Feb 1982)			
5	*See* BNL-31649	DE82020372	MN -25	7:59709
CONF-820387-	(Microelectronics measurement and test conference, San Jose, CA, USA, 23-24 Mar 1982)			
1	*See* BDX-613-2648	DE82020086	MN -25	7:59794
CONF-820388-	(Conference on Matrix Pencils, Pitea, Sweden, 1 Mar 1982)			
1	*See* UIUCDCS-R-82-1086	DE82020138	MN -32	7:60702
CONF-820435-	(CLEOS conference, Phoenix, AZ, USA, 14 Apr 1982)			
2	*See* UCRL-86893	DE82020169	MN -37	7:60603
CONF-820441-	(15. oil shale symposium, Golden, CO, USA, 27-30 Apr 1982)			
5	*See* LBL-14666	DE82020295	MN -91	7:59222
CONF-820459-	(Beryllium subwog meeting, Denver, CO, USA, 19-20 Apr 1982)			
3	*See* UCRL-87392	DE82020851	MN -25	7:59747
CONF-820475-	(Conference on new horizons on electromagnetic physics, Charlottesville, VA, USA, 21-24 Apr 1982)			
1	*See* BNL-31684	DE82020370	MN -28	7:59935
2	*See* DOE/ER/40048-10N2	DE82020146	MN -34D	7:60335
CONF-820476-	(25. meeting of the IMOG subgroup on joining, Kansas City, MO, USA, 26-27 Apr 1982)			
1	*See* SAND-82-1789C	DE82020358	MN -38	7:59745
CONF-820477-	(World Health Organization symposium on biological effects of man-made mineral fibers, Copenhagen, Denmark, 20-22 Apr 1982)			
1	*See* LA-UR-82-2300	DE82021923	MN -48	7:60282
CONF-820517-	(IEEE international conference on plasma science, Ottawa, Canada, 17-19 May 1982)			
2	*See* LA-UR-82-2374	DE82021880	MN -34	7:59936
CONF-820546-	(9. international cyrogenic engineering conference, Kobe, Japan, 10-14 May 1982)			
9	*See* LBL-14215	DE82020549	MN -28	7:60074
10	*See* LBL-14400	DE82020517	MN -28	7:59983
CONF-820548-	(International symposium on the properties and applications of metal hydrides, Toba, Japan, 30 May-4 Jun 1982)			
5	*See* SAND-82-0125C	DE82020183	MN -34	7:59767
CONF-8205103-	(Workshop on physics at LEAR with low energy cooled antiprotons, Erice, Italy, 9-16 May 1982)			
3	*See* LA-UR-82-2540	DE82022016	MN -34C	7:60377
CONF-8205116-	(5. international conference on novel results in particle physics, Nashville, TN, USA, 24-26 May 1982)			
1	*See* SLAC-PUB-2947	DE82020470	MN -28	7:60342
2	*See* SLAC-PUB-2944	DE82020739	MN -34D	7:60341
CONF-820604-	(AIAA/ASME joint conference on fluids, plasma, thermophysics and heat transfer, St Louis, MO, USA, 7-11 Jun 1982)			
12	NTIS, PC A03/MF A01	DE82019033	MN -96	7:59943
CONF-820609-	(American Nuclear Society annual meeting, Los Angeles, CA, USA, 6-11 Jun 1982)			
	Trans. Am. Nucl. Soc., 41: 114(Jun 1982)			7:59269
	Trans. Am. Nucl. Soc., 41: 90(Jun 1982)			7:59275
	Trans. Am. Nucl. Soc., 41: 91(Jun 1982)			7:59276
	Trans. Am. Nucl. Soc., 41: 92(Jun 1982)			7:59277
	Trans. Am. Nucl. Soc., 41: 80(Jun 1982)			7:59314
	Trans. Am. Nucl. Soc., 41: 83(Jun 1982)			7:59315
	Trans. Am. Nucl. Soc., 41: 84(Jun 1982)			7:59316
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	Trans. Am. Nucl. Soc., 41: 236(Jun 1982)			7:60272
CONF-820626-	(15. power modulator symposium, Baltimore, MD, USA, 14-16 Jun 1982)			
10	*See* BNL-31427	DE82020002	MN -28	7:60008
CONF-820628-	(11. international symposium on effects of radiation on materials, American Society for Testing and Materials, Scottsdale, AZ, USA, 28-30 Jun 1982)			
17	*See* HEDL-SA-2554-FP	DE82020501	MN -79b	7:59510
CONF-820654-	(International symposium on time dependent Hartree-Fock and beyond, Bad Honnef, F.R. Germany, 7 Jun-11 Jul 1982)			
3	*See* UCRL-88037	DE82020497	MN -34A	7:60499
CONF-820656-	(Workshop on low-probability/high consequence risk analysis, Arlington, VA, USA, 15-16 Jun 1982)			
4	*See* BNL-NUREG-31733		MN -38	7:59478
CONF-820666-	(International symposium on the synthesis and applications of isotopically labeled compounds, Kansas City, MO, USA, 6-11 Jun 1982)			
7	*See* BNL-31713	DE82020526	MN -4	7:59859
CONF-820685-	(14. biomass thermochemical conversion contractor's meeting, Arlington, VA, USA, 23-24 Jun 1982)			
2	*See* SERI/TP-234-1654	DE82019768	MN -61a	7:59366

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CONF-820694-	(Chalmers symposium on plasma theory and experiment, Aspenasgarden, Sweden, 16-18 Jun 1982)			
3	*See* LBL-14683	DE82019299	MN -20g	7:60570
CONF-820698-	(36. annual frequency control symposium, Philadelphia, PA, USA, 4 Jun 1982)			
2	*See* SAND-82-1486C	DE82019487	MN -04	7:59768
CONF-8206107-	(18. Alfred Benzon symposium - haemopoietic stem cells, Copenhagen, Denmark, 13-17 Jun 1982)			
1	*See* BNL-31594	DE82019980	MN -48	7:60230
CONF-8206109-	(Symposium on random walks, Washington, DC, USA, 28 Jun-1 Jul 1982)			
1	*See* SAND-82-1724C	DE82019346	MN -34D	7:60512
CONF-8206110-	(Symposium on production and physics of highly charged ions, Stockholm, Sweden, 1-5 Jun 1982)			
1	*See* LBL-14658	DE82020067	MN -20	7:60569
2	*See* BNL-31681	DE82020528	MN -28	7:60308
3	*See* PPPL-1926	DE82020258	STD -20f	7:60597
CONF-8206114-	(Cold Spring Harbor symposium - quantitative biology, Cold Spring Harbor, NY, USA, 2-9 Jun 1982)			
1	*See* BNL-31730	DE82020742	MN -48	7:60229
CONF-820704-	(International topical meeting on LMFBR safety, Lyon, France, 18-23 Jul 1982)			
22	*See* HEDL-SA-2727	DE82020502	MN -79p	7:59513
23	*See* HEDL-SA-2614	DE82020512	MN -79p	7:59566
24	*See* HEDL-SA-2606-FP	DE82020513	MN -79p	7:59586
25	*See* HEDL-SA-2584-FP	DE82020514	MN -79p	7:59584
26	*See* HEDL-SA-2587-FP	DE82018097	MN -79p	7:59585
28	*See* HEDL-SA-2592-FP	DE82020279	MN -79p	7:59511
CONF-820718-	(21. international conference on high energy physics, Paris, France, 29 Jul-8 Aug 1982)			
5	*See* DOE/ER/01545-323	DE82021910	MN -34D	7:60344
6	*See* DOE/ER/40033-26	DE82022003	MN -34C	7:60334
CONF-820729-	(Summer computer simulation conference, Denver, CO, USA, 19-21 Jul 1982)			
2	NTIS, PC A02/MF A01	DE82018163	MN -11	7:60164
CONF-820732-	(International union of pure and applied physics conference, Boulder, CO, USA, 12-16 Jul 1982)			
2	*See* UCRL-87983	DE82020163	MN -34A	7:60320
CONF-820737-	(14. annual symposium on the interface Rensselaer Polytechnic Institute on computer science and statistics, Troy, NY, USA, 6-7 Jul 1982)			
1	NTIS, PC A03/MF A01	DE82018265	MN -32	7:60681
CONF-820738-	(INS symposium on dynamics of nuclear collective motion, Mount Fuji, Japan, 6-10 Jul 1982)			
2	*See* LBL-14641	DE82020267	MN -34C	7:60498
3	*See* BNL-NCS-31677	DE82020745	MN -34C	7:60431
4	*See* BNL-31760	DE82020790	MN -34C	7:60403
CONF-820739-	(International symposium on modelling, policy, and economics of energy; and power systems and alternative energy sources and technology, Cambridge, MA, USA, 7-9 Jul 1982)			
1	NTIS, PC A02/MF A01	DE82018158	MN -91	7:59225
CONF-820741-	(Synchrotron radiation conference, Novosibirsk, USSR, 27-29 Jul 1982)			
1	*See* BNL-31571	DE82018058	MN -28	7:60073
CONF-820743-	(2. international otto schott colloquium, Jena, F.R. Germany, 12-16 Jul 1982)			
1	*See* UCRL-87964	DE82020162	MN -21	7:59937
CONF-820744-	(2. international symposium on statistical mechanics of adsorption, Trieste, Italy, 1 Jul 1982)			
1	*See* BNL-31578	DE82019349	MN -28	7:59788
CONF-820801-	(19. international symposium on combustion, Haifa, Israel, 8-13 Aug 1982)			
13	*See* EGG-1183-1836	DE82019939	MN -34B	7:60303
CONF-820802-	(International meeting on thermal nuclear reactor safety, Chicago, IL, USA, 29 Aug-2 Sep 1982)			
3	*See* UCRL-87070	DE82010244	MN -11	7:60169
8	*See* LA-UR-82-2522	DE82020828	MN -78	7:59594
9	*See* SAND-82-0283C	DE82020406	MN -78	7:59607
10	*See* SAND-82-1987C	DE82020413	MN -78	7:59609
11	*See* LA-UR-82-2521	DE82021765	MN -78	7:59593
12	NTIS, PC A03/MF A01	DE82020812	MN -78	7:59579
13	*See* SAND-82-2001C	DE82022026	MN -78	7:59610
14	*See* LA-UR-82-2298	DE82021922	MN -78	7:59592
15	*See* SAND-82-0451C	DE82020821	MN -78	7:59483
CONF-820806-	(40. Electron Microscopy Society of America annual meeting, Washington, DC, USA, 9-13 Aug 1982)			
2	*See* HEDL-SA-2683	DE82020504	MN -79b	7:59717
3	NTIS, PC A02/MF A01	DE82020929	MN -77	7:59494
CONF-820807-	(16. annual meeting of the Microbeam Analysis Society, Washington, DC, USA, 9-13 Aug 1982)			
3	*See* UCRL-87780	DE82020158	MN -34A	7:59827
CONF-820809-	(7. international conference on thermal analysis, Kingston, Canada, 22 Aug 1982)			
4	*See* UCRL-86894	DE82020496	MN -25	7:59785

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CONF-820810-	(10. international mathematics and computers simulation congress on systems simulation and scientific computation, Montreal, Canada, 9-13 Aug 1982)			
10-Rev.1	*See* UCRL-87454-Rev.1	DE82020165	MN -20g	7:60604
11	NTIS, PC A02/MF A01	DE82020909	MN -32	7:60682
CONF-820814-	(17. Intersociety Energy Conversion Engineering conference, Los Angeles, CA, USA, 8-13 Aug 1982)			
12	*See* LA-UR-82-1270	DE82015445	MN -38	7:59521
21	*See* DOE/NASA/12726-16	DE82020785	STD -94cb	7:59667
22	*See* DOE/NASA/51044-26	DE82020702	STD -94c	7:59627
23	NTIS MF A01	DE82020814	MN -94a	7:59619
24	NTIS, PC A02/MF A01	DE82020820	MN -90f	7:59459
25	NTIS MF A01	DE82020815	MN -94a	7:59620
26	NTIS, PC A02/MF A01	DE82020831	MN -90d	7:59105
27	NTIS, PC A02/MF A01	DE82020809	MN -94b	7:59614
28	NTIS, PC A03/MF A01	DE82020773	MN -94a	7:59674
CONF-820827-	(Energy storage contractors review meeting, Arlington, VA, USA, 23-26 Aug 1982)			
4	*See* UCRL-86557-82	DE82020729	MN -94b	7:59617
6	NTIS, PC A02/MF A01	DE82020823	MN -94a	7:59675
7	NTIS, PC A02/MF A01	DE82020894	MN -94b	7:59615
8	NTIS, PC A02/MF A01	DE82020825	MN -94b	7:59616
9	NTIS, PC A02/MF A01	DE82020826	MN -94a	7:59621
10	NTIS, PC A02/MF A01	DE82020827	MN -94a	7:59622
12	NTIS, PC A02/MF A01	DE82020804	MN -59c	7:59411
13	NTIS, PC A02/MF A01	DE82020840	MN -95d	7:59676
14	NTIS, PC A02/MF A01	DE82020839	MN -95d	7:59677
15	NTIS, PC A02/MF A01	DE82020838	MN -96	7:59701
16	NTIS, PC A02/MF A01	DE82020817	MN -95d	7:59678
17	NTIS, PC A02/MF A01	DE82020818	MN -95d	7:59679
19	NTIS, PC A02/MF A01	DE82020895	MN -94a	7:59623
CONF-820828-	(International conference on nuclear structure, Amsterdam, Netherlands, 29 Aug-4 Sep 1982)			
5	*See* LA-UR-82-2541	DE82022015	MN -34C	7:60378
CONF-820833-	(17. DOE nuclear air cleaning conference, Denver, CO, USA, 1 Aug-6 Sep 1982)			
11	*See* HEDL-SA-2637-FP	DE82020617	MN -79a	7:59512
12	NTIS, PC A02/MF A01	DE82020837	MN -86	7:59278
CONF-820834-	(3. AAPG circum-Pacific Energy and Materials conference, Honolulu, HI, USA, 22-28 Aug 1982)			
3	*See* SAND-82-0261C	DE82020626	MN -66c	7:59453
CONF-820840-	(8. underground coal conversion symposium, Keystone, CO, USA, 15-19 Aug 1982)			
1	*See* UCRL-87689	DE82020160	MN -90c	7:59127
2	*See* UCRL-87789	DE82020164	MN -90c	7:59128
6	*See* MLM-2979-OP	DE82020156	MN -90c	7:59117
8	*See* UCRL-88015	DE82020349	MN -90c	7:59129
9	*See* SAND-82-0970C	DE82020354	MN -90c	7:59918
10	*See* SAND-82-0988C	DE82020311	MN -90c	7:59124
11	*See* SAND-82-0958C	DE82020627	MN -90c	7:59123
12	*See* SAND-82-0971C	DE82020357	MN -90c	7:59919
CONF-820841-	(29. international field emission symposium, Goteborg, Sweden, 9-13 Aug 1982)			
2	*See* SAND-82-1792C	DE82020093	MN -34A	7:59824
CONF-820843-	(US-Japan seminar on new models and constitutive relations in the mechanics of granular materials, Ithaca, NY, USA, 22-27 Aug 1982)			
1	*See* SAND-82-1682C	DE82019345	MN -25	7:60325
CONF-820844-	(Cyber 205 applications symposium, Ft Collins, CO, USA, 12-13 Aug 1982)			
1	*See* UCRL-87971	DE82020166	MN -32	7:60701
CONF-820845-	(Alpha-contaminated waste management meeting, Gaithersburg, MD, USA, 10-13 Aug 1982)			
1	*See* SAND-82-1710C	DE82019431	MN -70	7:59273
CONF-820846-	(10. international congress on electron microscopy, Hamburg, F.R. Germany, 17-24 Aug 1982)			
1	*See* LBL-14528	DE82019302	MN -25	7:59822
CONF-820848-	(24. Scottish Universities summer school in physics, St Andrews, UK, 1-14 Aug 1982)			
1	*See* UCRL-87980	DE82020350	MN -21	7:60579
CONF-820849-	(Summer study in energy efficient buildings, Santa Cruz, CA, USA, 22-28 Aug 1982)			
1	*See* LBL-14734	DE82020313	MN -95d	7:59683
2	NTIS, PC A02/MF A01	DE82020810	MN -95d	7:59680
4	*See* SERI/TP-254-1675	DE82021603	MN -59c	7:59388
CONF-820852-	(Conference on cryptosystems, Santa Barbara, CA, USA, 23-25 Aug 1982)			
1	*See* SAND-82-0956C	DE82020356	MN -90c	7:59122
2	*See* SAND-82-1908C	DE82020628	MN -32	7:60695
CONF-820853-	(NATO conference on photophysics and photochemistry in the vacuum ultraviolet, Lake Geneva, WI, USA, 15-29 Aug 1982)			
1	NTIS, PC A02/MF A01	DE82020824	MN -4	7:59850
3	NTIS, PC A04/MF A01	DE82020832	MN -34A	7:60309

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CONF-820854-	(4. annual DOE LLWMP participant's information meeting, Denver, CO, USA, 31 Aug-2 Sep 1982)			
1	*See* MLM-2988-OP	DE82020774	MN -70	7:59299
2	NTIS, PC A02/MF A01	DE82020819	MN -70	7:59279
10	*See* MLM-2987-OP	DE82020775	MN -70	7:59298
CONF-820855-	(International conference on X-ray and atomic inner-shell physics, Eugene, OR, USA, 23-27 Aug 1982)			
1	NTIS, PC A02/MF A01	DE82020805	MN -34A	7:60310
CONF-820856-	(IUFRO symposium on forest site and continuous productivity, Seattle, WA, USA, 23-25 Aug 1982)			
1	NTIS, PC A03/MF A01	DE82020808	MN -11	7:60231
CONF-820859-	(Gas-cooled reactor associates utilities/users conference on the HTGR, San Diego, CA, USA, 9-10 Aug 1982)			
1	NTIS, PC A02/MF A01	DE82020811	MN -77	7:59495
CONF-820860-	(International conference on plant and vegetable oils as fuels, Fargo, ND, USA, 2-4 Aug 1982)			
1	NTIS, PC A02/MF A01	DE82020835	MN -61a	7:59688
CONF-820861-	(31. annual Denver X-ray conference, Denver, CO, USA, 3-5 Aug 1982)			
1	*See* Y/DW-341	DE82020620	MN -25	7:59749
CONF-820863-	(7. ACS biennial conference on chemical education, Stillwater, OK, USA, 1 Aug 1982)			
1	*See* BNL-NCS-31694	DE82020741	MN -4	7:59841
CONF-820864-	(4. europhysical topical conference on lattice defects in ionic crystals, Dublin, Ireland, 30 Aug-3 Sep 1982)			
1	*See* BNL-31665	DE82020744	MN -34	7:60510
2	*See* BNL-31664	DE82020743	MN -70	7:59852
3	*See* SAND-82-1045C	DE82021726	MN -70	7:59308
CONF-820865-	(6. international ice symposium, Rolla, MO, USA, 1 Aug 1982)			
1	*See* BNL-31739	DE82020765	MN -4	7:59840
CONF-820866-	(7. international conference on gas discharges and their applications, London, UK, 31 Aug-3 Sep 1982)			
1	NTIS, PC A02/MF A01	DE82020911	MN -34A	7:59469
CONF-820908-	(IEEE conference on circuits and computers, New York, NY, USA, 29 Sep-1 Oct 1982)			
3	*See* LA-UR-82-2326	DE82021769	MN -32	7:60690
CONF-820909-	(National meeting of the American Chemical Society, Kansas City, MO, USA, 1 Sep 1982)			
8	*See* UCRL-87546	DE82020847	MN -4	7:59786
CONF-820926-	(Marine Technology Society and Geological Society of America conference on oceans, Washington, DC, USA, 20-22 Sep 1982)			
3	*See* HEDL-SA-2650	DE82020641	MN -25	7:60131
CONF-820930-	(9. international conference on plasma physics and controlled nulcear fusion research, Baltimore, MD, USA, 1-8 Sep 1982)			
7	*See* DOE/ET/53051-43	DE82020261	STD -20	7:60563
8	*See* UCRL-87021	DE82020283	MN -20g	7:60578
11	*See* LA-UR-82-2292	DE82021921	MN -20d	7:60595
CONF-820931-	(8. symposium on microdosimetry, Julich, F.R. Germany, 27 Sep-1 Oct 1982)			
3	*See* BNL-31780	DE82022044	MN -48	7:60232
CONF-820933-	(International conference on radioactive waste management, Winnipeg, Manitoba, Canada, 12-15 Sep 1982)			
2	*See* UNI-SA-95	DE82020524	MN -70A	7:59313
CONF-820937-	(16. international conference on the physics of semiconductors, Montpellier, France, 6-10 Sep 1982)			
1	*See* BNL-31574	DE82016331	MN -28	7:59787
3	*See* LBL-14067	DE82020519	MN -34A	7:60511
CONF-820938-	(IEEE fall computer conference, Washington, DC, USA, 21-23 Sep 1982)			
1	*See* LBL-14771	DE82020312	MN -32	7:60692
CONF-820939-	(3. Air Infiltration Centre conference on energy efficient domestic ventilation systems for achieving acceptable indoor air quality, London, UK, 20-23 Sep 1982)			
1	*See* LBL-13678	DE82020314	MN -11	7:60154
CONF-820940-	(Passive and hybrid solar energy update conference, Washington, DC, USA, 15-17 Sep 1982)			
2	*See* LA-UR-82-2496	DE82021760	MN -59a	7:59382
CONF-820941-	(5. international symposium on high energy spin physics, Brookhaven, NY, USA, 16-22 Sep 1982)			
1	*See* TRI-PP-82-19	DE82906210	MN -34D	7:60352
CONF-820942-	(Nuclear data for science and technology international conference, Antwerp, Belgium, 6-10 Sep 1982)			
1	*See* LA-UR-82-2528	DE82021694	MN -34C	7:60497
2	*See* UCRL-87279	DE82020864	MN -34C	7:60052
CONF-820943-	(ANS topical meeting - spent fuel storage, Savannah, GA, USA, 26-29 Sep 1982)			
1	*See* SAND-82-1894C	DE82020625	MN -85	7:59274
CONF-821001-	(STTFUA high-intensity solar flux measuring techniques workshop, Albuquerque, NM, USA, 26-27 Oct 1982)			
1	*See* SAND-81-2390C	DE82006282	MN -62	7:59387
CONF-821002-	(3. international conference on distributed computing systems, Miami, FL, USA, 18-22 Oct 1982)			
2	*See* LA-UR-82-2059	DE82019559	MN -32	7:60689

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3	*See* UCRL-87795	DE82020174	MN -32	7:60700
CONF-821005-	(DOE international decommissioning symposium, Seattle, WA, USA, 10-14 Oct 1982)			
1	*See* LA-UR-82-1062	DE82014084	MN -70	7:59296
2	*See* LA-UR-82-1279	DE82015812	MN -41	7:59328
3	*See* MLM-2976-OP	DE82019978	MN -70A	7:59297
4	*See* UNI-SA-103	DE82020522	MN -70A	7:59533
5	*See* UNI-SA-105	DE82020521	MN -70A	7:59534
6	*See* UNI-SA-102	DE82020523	MN -70A	7:59329
11	*See* MLM-2991-OP	DE82021347	MN -70A	7:59300
CONF-821006-	(7. conference on local computer networks, Minneapolis, MN, USA, 12-13 Oct 1982)			
2	*See* UCRL-87474	DE82015188	MN -32	7:60699
CONF-821007-	(Annual goethermal resources council meeting, San Diego, CA, USA, 11-14 Oct 1982)			
1	*See* LA-UR-82-1434	DE82015727	MN -66	7:59423
2	*See* SAND-82-1435C	DE82016787	MN -66a	7:59456
3	*See* SAND-82-1404C	DE82017071	MN -66c	7:59455
4	*See* LA-UR-82-1561	DE82018380	MN -66c	7:59447
5	*See* LA-UR-82-1578	DE82018369	MN -66b	7:59451
6	*See* LA-UR-82-1527	DE82018385	MN -66b	7:59424
7	*See* LA-UR-82-1564	DE82018365	MN -66b	7:59450
8	*See* LA-UR-82-1562	DE82018363	MN -66c	7:59448
9	*See* LA-UR-82-1563	DE82018364	MN -66c	7:59449
10	*See* SAND-82-1374C	DE82016701	MN -66c	7:59454
11	*See* LA-UR-82-1710	DE82018412	MN -66b	7:59417
12	*See* LBL-14534	DE82018619	MN -66a	7:59419
13	*See* LA-UR-82-2020	DE82019563	MN -66b	7:59452
CONF-821008-	(IEEE annual meeting of the Industry Applications Society, San Francisco, CA, USA, 4-7 Oct 1982)			
1	*See* UCRL-87605	DE82015758	MN -97a	7:59477
CONF-821009-	(32. annual meeting of the Gulf Coast Association of Geological Societies, Houston, TX, USA, 26-31 Oct 1982)			
1	NTIS, PC A02/MF A01	DE82016166	MN -66	7:59415
2	NTIS, PC A03/MF A01	DE82016920	MN -66	7:59416
CONF-821010-	(14. national SAMPE technical conference, Atlanta, GA, USA, 12-14 Oct 1982)			
1	*See* SAND-82-0663	DE82017026	MN -25	7:59784
2	*See* UCRL-87821	DE82019239	MN -4	7:59775
CONF-821011-	(IEEE nuclear science symposium, Washington, DC, USA, 20-22 Oct 1982)			
1	*See* BNL-31347	DE82016143	MN -37	7:60076
CONF-821013-	(Conference on electrical insulation and dielectric phenomena, Amherst, MA, USA, 17-21 Oct 1982)			
1	*See* SAND-82-1088C	DE82016723	MN -94	7:59956
2	*See* LA-UR-82-1867	DE82017586	MN -21	7:60594
CONF-821014-	(5. IEEE symposium on mass storage system, Denver, CO, USA, 15 Oct 1982)			
1	*See* LA-UR-82-1708	DE82018376	MN -32	7:60687
CONF-821015-	(Electrochemical Society fall meeting, Detroit, MI, USA, 17-22 Oct 1982)			
1	*See* BNL-31458	DE82017632	MN -94cc	7:59624
CONF-821016-	(9. symposium on engineering problems of fusion research, Chicago, IL, USA, 26-29 Oct 1982)			
1-Rev.1	*See* UCRL-86013-Rev.1	DE82017294	MN -38	7:60602
CONF-821017-	(6. AIAA sounding rocket conference, Orlando, FL, USA, 26-28 Oct 1982)			
1	*See* SAND-82-0635C	DE82017623	MN -45	7:60306
2	*See* SAND-82-0711C	DE82018749	MN -2	7:59917
3	*See* SAND-82-0636C	DE82019486	MN -2	7:60678
4	*See* SAND-82-1837C	DE82020035	MN -2	7:60146
CONF-821018-	(American Society of Mechanical Engineers conference on power generation, Denver, CO, USA, 17-21 Oct 1982)			
1	*See* DOE/NASA/10350-33	DE82018241	STD -90f	7:59961
CONF-821019-	(SAE aerospace meeting, Anaheim, CA, USA, 25-28 Oct 1982)			
1	*See* SAND-82-1631C	DE82018973	MN -32	7:59920
CONF-821020-	(American Society Non-destructive Testing conference, Philadelphia, PA, USA, 4-7 Oct 1982)			
1	*See* UCRL-87805	DE82019244	MN -38	7:59948
CONF-821021-	(DOE statistical symposium, Idaho Falls, ID, USA, 1 Oct 1982)			
1	*See* LA-UR-82-1893	DE82019576	MN -32	7:60688
CONF-821022-	(AVERE drive electric conference, Amsterdam, Netherlands, 25-29 Oct 1982)			
1	*See* DOE/NASA/51044-27	DE82020308	MN -96	7:59699
CONF-821023-	(4. international conference on composite materials, Tokyo, Japan, 24-28 Oct 1982)			
1	*See* UCRL-87827	DE82019108	MN -25	7:59776
CONF-821024-	(10. international symposium on discharges and electrical insulation in vacuum, Columbia, SC, USA, 25-28 Oct 1982)			
1	*See* SAND-82-0856C	DE82019735	MN -38	7:59955
CONF-821025-	(Annual meeting on the Society of Exploration Geophysicists, Dallas, TX, USA, 17-21 Oct 1982)			
1	*See* LBL-14319	DE82020065	MN -66b	7:59425

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CONF-821026-	(2. international workshop on the impact of hydrogen on water reactor safety, Albuquerque, NM, USA, 3-7 Oct 1982)			
1	*See* SAND-82-1841C	DE82020353	MN -45	7:60143
2	*See* SAND-82-2005C	DE82020606	MN -78	7:59611
4	*See* SAND-82-1215C	DE82022027	MN -78	7:59608
CONF-821027-	(5. annual pulsed power conference, Columbia, SC, USA, 25-27 Oct 1982)			
1	*See* SAND-82-1838C	DE82020101	MN -97a	7:59957
CONF-821028-	(National conference of Standards Laboratories, Gaithersburg, MD, USA, 4-7 Oct 1982)			
1	*See* SAND-82-1943C	DE82020405	MN -37	7:60140
COO-				
1764-435	*See* DOE/ER/40051-435	DE82020959	MN -34D	7:60336
2383-0083	*See* UIUCDCS-R-82-1086	DE82020138	MN -32	7:60702
2383-0085	*See* DOE/ER/02383-0085	DE82020803	MN -32	7:60683
3244-97	*See* DOE/ER/03244-97	DE82020746	MN -34C	7:60332
3571-22	*See* DOE/EV/03571-T1	DE82020781	MN -48	7:60274
4385-6	*See* DOE/ER/04385-6	DE82021916	MN -25	7:59713
4831-5	*See* DOE/ER/04831-5	DE82022008	MN -34D	7:60333
CRREL-				
81-24	*See* AD-A-112365/2			7:59694
81-25	*See* AD-A-112813/1			7:59618
CRREL-SR-				
81-32	*See* AD-A-112170/6			7:59702
CW-WR-				
76-020.77A	NTIS, PC A13/MF A01	DE82020280	STD -90e	7:59460
76-020.98A	NTIS, PC A06/MF A01	DE82020287	STD -90e	7:59461
DL/SCI/P-				
306T	*See* PB-82-187261			7:60319
DOE/BC/10079-				
48	NTIS, PC A16/MF A01	DE82020945	STD -92a	7:59164
DOE/BC/10326-				
4	NTIS, PC A04/MF A01	DE82021664	STD -92a	7:59165
DOE/BETC-				
82/ 2	NTIS, PC A07/MF A01	DE82021689	STD -92a	7:59166
DOE/CH/10012-				
T1	NTIS, PC A04/MF A01	DE82021824	STD -94cb	7:59625
T2	NTIS, PC A09/MF A01	DE82021825	STD -94cb	7:59626
DOE/CS/20376-				
1	NTIS, PC A09/MF A01	DE82020791	MN -95d	7:59681
DOE/CS/30013-				
U9	NTIS, PC A13/MF A01	DE82020564	STD -98B	7:59173
DOE/CS/30364-				
T1	NTIS, PC A04/MF A01	DE82015223	MN -59c	7:59379
DOE/CS/32128-				
T1	NTIS, PC A07/MF A01	DE82021993	MN -59	7:59380
DOE/CS/40312-				
T1	NTIS, PC A04/MF A01	DE82019482	MN -95d	7:59689
DOE/CS/50026-				
1	NTIS, PC A11/MF A01	DE82020752	STD -96	7:59697
DOE/CS/51212-				
T1	NTIS, PC A03/MF A01	DE82021980	MN -96	7:59706
DOE/CS/56051-				
7	NTIS, PC A05/MF A01	DE82020493	STD -96	7:59707
DOE/EA-				
0128	NTIS, PC A04/MF A01	DE82021585	STD -70	7:59325
0163	NTIS, PC A04/MF A01	DE82016077	MN -11	7:59660
0195	NTIS, PC A10/MF A01	DE82020304	MN -11	7:60204
DOE/EIA-				
0341	NTIS, PC A08/MF A01	DE82020578	STD -95	7:59358
0356/ 1	NTIS, PC A04/MF A01	DE82021751	STD -98E	7:59658
DOE/EIA/02295-				
T1	NTIS, PC A02/MF A01	DE82020395	MN -90d	7:59151
DOE/EIS-				
0084	NTIS, PC A19/MF A01	DE82021911	MN -70	7:59280
0094D	Dept. of Energy, Oak Ridge Operations, Environmental Protection Branch, P.O. Box E, Oak Ridge, TN 37830		ND -11	7:60202
DOE/EP-				
0056/ 1	NTIS, PC A04/MF A01	DE82021215	STD -41	7:59949
DOE/ER-				
0143	NTIS, PC A09/MF A01	DE82021748	STD -25	7:59711
DOE/ER/01198-				
1378	NTIS, PC A13/MF A01	DE82021606	MN -34	7:59712
1387	NTIS, PC A09/MF A01	DE82020141	MN -4	7:60311
DOE/ER/01545-				
323	NTIS, PC A02/MF A01	DE82021910	MN -34D	7:60344
324	NTIS, PC A02/MF A01	DE82020750	MN -34D	7:60345
DOE/ER/01764-				
435	*See* DOE/ER/40051-435	DE82020959	MN -34D	7:60336
DOE/ER/02203-				
T1	NTIS, PC A02/MF A01	DE82020046	MN -34D	7:60514
DOE/ER/02383-				
0085	NTIS, PC A02/MF A01	DE82020803	MN -32	7:60683
DOE/ER/02853-				
16	NTIS, PC A03/MF A01	DE82019270	MN -28	7:60381

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DOE/ER/03065-T3	NTIS, PC A03/MF A01	DE82019843	MN -34D	7:60331
DOE/ER/03244-97	NTIS, PC A05/MF A01	DE82020746	MN -34C	7:60332
DOE/ER/03326-T1	NTIS, PC A06/MF A01	DE82021992	MN -48	7:60205
DOE/ER/04075-T2	NTIS, PC A02/MF A01	DE82019267	MN -25	7:59758
DOE/ER/04385-6	NTIS, PC A02/MF A01	DE82021916	MN -25	7:59713
DOE/ER/04831-5	NTIS, PC A02/MF A01	DE82022008	MN -34D	7:60333
DOE/ER/05002-28	NTIS, PC A03/MF A01	DE82022006	MN -25	7:59714
DOE/ER/10088-T1	NTIS, PC A03/MF A01	DE82021991	MN -95e	7:59958
DOE/ER/10445-T1	NTIS, PC A02/MF A01	DE82021818	MN -11	7:60300
DOE/ER/10554-14-Rev.1	NTIS, PC A02/MF A01	DE82020763	MN -4	7:59795
19-Rev.1	NTIS, PC A04/MF A01	DE82020760	MN -4	7:59796
24	NTIS, PC A05/MF A01	DE82020758	MN -4	7:59797
25	NTIS, PC A02/MF A01	DE82020753	MN -04	7:59798
DOE/ER/10968-1	NTIS, PC A02/MF A01	DE82021579	MN -4	7:59849
DOE/ER/10970-1	NTIS, PC A02/MF A01	DE82020799	MN -90a	7:59906
DOE/ER/40033-26	NTIS, PC A02/MF A01	DE82022003	MN -34C	7:60334
DOE/ER/40048-2L2	NTIS, PC A02/MF A01	DE82020195	MN -37	7:60080
4L2	NTIS, PC A02/MF A01	DE82020193	MN -34C	7:60404
5L2	NTIS, PC A02/MF A01	DE82020194	MN -4	7:60302
10N2	NTIS, PC A02/MF A01	DE82020146	MN -34D	7:60335
DOE/ER/40051-435	NTIS, PC A03/MF A01	DE82020959	MN -34D	7:60336
DOE/ET/10060-84-Vol.1	NTIS, PC A20/MF A01	DE82020062	STD -90d	7:59106
DOE/ET/10069-89	NTIS (US Sales Only), MF A0115/MF A01	DE82020944	STD -90d	7:59107
DOE/ET/10149-T4	NTIS, PC A03/MF A01	DE82021814	MN -90d	7:59108
DOE/ET/10638-T1	NTIS, PC A04/MF A01	DE82016127	STD -90b	7:59132
DOE/ET/10815-66	NTIS, PC A03/MF A01	DE82016915	STD -90g	7:59661
70	NTIS, PC A04/MF A01	DE82016958	STD -90g	7:59662
73	NTIS, PC A04/MF A01	DE82019832	STD -90g	7:59663
DOE/ET/12056-22	NTIS, PC A05/MF A01	DE82021657	STD -92a	7:59167
31	NTIS, PC A07/MF A01	DE82021604	STD -92a	7:59168
34	NTIS, PC A08/MF A01	DE82021660	STD -92a	7:59169
DOE/ET/12082-8	NTIS, PC A07/MF A01	DE82021827	STD -92a	7:59170
DOE/ET/12382-11	NTIS, PC A06/MF A01	DE82021610	STD -92a	7:59171
DOE/ET/12581-T1	NTIS, PC A07/MF A01	DE82020535	STD -88	7:59146
DOE/ET/14700-11	NTIS, PC A04/MF A01	DE82019812	STD -90d	7:59109
DOE/ET/14752-28	NTIS, PC A14/MF A01	DE82021338	STD -90c	7:59110
DOE/ET/14876-11	NTIS, PC A03/MF A01	DE82020586	MN -90d	7:59111
DOE/ET/15529-8	NTIS, PC A05/MF A01	DE82021828	STD -90g	7:59664
DOE/ET/20068-T1-Vol.1	NTIS, PC A06/MF A01	DE82021985	MN -61	7:59359
T1-Vol.4	NTIS, PC A13/MF A01	DE82021986	MN -61	7:59360
DOE/ET/20279-207	NTIS, PC A02/MF A01	DE82021956	STD -63	7:59369
214	NTIS, PC A02/MF A01	DE82021954	STD -63	7:59370
216	NTIS, PC A03/MF A01	DE82021955	STD -63	7:59356
DOE/ET/20422-1	NTIS MF A01	DE82021806	STD -62e	7:59412
DOE/ET/27100-1	NTIS, PC A03/MF A01	DE82021815	STD -66a	7:59421
DOE/ET/28406-1	NTIS, PC A05/MF A01	DE82020632	MN -66a	7:59422
DOE/ET/34215-30	NTIS (US Sales Only), MF A0103/MF A01	DE82021749	STD -78	7:59479
DOE/ET/51013-49	NTIS, PC A02/MF A01	DE82021688	STD -20f	7:60561
51	NTIS, PC A05/MF A01	DE82021690	STD -20	7:60562

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DOE/ET/52027-5	NTIS, PC A02/MF A01	DE82020800	MN -20c	7:60592
DOE/ET/53016-79	NTIS, PC A03/MF A01	DE82021583	MN -20f	7:60593
DOE/ET/53051-43	NTIS, PC A02/MF A01	DE82020261	STD -20	7:60563
DOE/EV/02758-8	NTIS, PC A02/MF A01	DE82020747	MN -88	7:59139
DOE/EV/03110-32	NTIS, PC A02/MF A01	DE82018433	MN -48	7:60234
DOE/EV/03571-T1	NTIS, PC A02/MF A01	DE82020781	MN -48	7:60274
DOE/EV/03728-15	NTIS, PC A02/MF A01	DE82020761	MN -48	7:60235
DOE/EV/04329-T1	NTIS, PC A03/MF A01	DE82021812	MN -11	7:60275
DOE/EV/10010-2	NTIS, PC A03/MF A01	DE82020639	MN -11	7:60196
DOE/EV/10244-5	NTIS, PC A02/MF A01	DE82020388	MN -25	7:59140
DOE/EV/10286-3	NTIS MF A01	DE82021803	STD -90j	7:59656
DOE/EV/10374-2	NTIS, PC A02/MF A01	DE82020802	MN -48	7:60081
DOE/EV/70288-T1	NTIS, PC A05/MF A01	DE82018424	MN -11	7:60276
DOE/FC/10120-6	NTIS, PC A06/MF A01	DE82021704	STD -90i	7:59136
DOE/FC/10281-1	NTIS, PC A07/MF A01	DE82020853	STD -90e	7:59959
DOE/FE/53179-01	NTIS, PC A05/MF A01	DE82021808	STD -90e	7:59462
DOE/GFETC/RI-82/2	NTIS, PC A03/MF A01	DE82021977	STD -90d	7:59112
DOE/ID-12126	NTIS, PC A05/MF A01	DE82021007	STD -97e	7:59350
DOE/ID/01719-5	NTIS, PC A02/MF A01	DE82021542	MN -66d	7:59443
DOE/ID/12101-4	NTIS, PC A11/MF A01	DE82021876	MN -66	7:59413
DOE/IR/11132-1	NTIS, PC A07/MF A01	DE82020151	MN -13	7:59696
DOE/JPL/955843-82/6	NTIS, PC A03/MF A01	DE82021554	STD -63b	7:59361
DOE/JPL/955986-3	NTIS, PC A02/MF A01	DE82021382	STD -63b	7:59362
DOE/LC/10787-97	NTIS, PC A03/MF A01	DE82020178	STD -91	7:59195
98	NTIS, PC A04/MF A01	DE82020618	STD -91	7:59196
DOE/MC/10689-11	NTIS, PC A05/MF A01	DE82021658	STD -92a	7:59172
DOE/MC/11577-T2	NTIS, PC A06/MF A01	DE82021805	STD -92a	7:59181
DOE/MC/16472-78/3	NTIS, PC A05/MF A01	DE82020557	MN -90a	7:59467
DOE/METC/SP-189	NTIS, PC A03/MF A01	DE82022077	STD -90c	7:59113
DOE/NASA/0145-1	NTIS, PC A05/MF A01	DE82021957	STD -90d	7:59960
DOE/NASA/10350-31	NTIS, PC A03/MF A01	DE82022040	STD -90f	7:59463
33	NTIS, PC A02/MF A01	DE82018241	STD -90f	7:59961
DOE/NASA/12726-16	NTIS, PC A02/MF A01	DE82020785	STD -94cb	7:59667
DOE/NASA/51044-26	NTIS, PC A02/MF A01	DE82020702	STD -94c	7:59627
27	NTIS, PC A02/MF A01	DE82020308	MN -96	7:59699
DOE/NBM-2019085	NTIS, PC A02/MF A01	DE82019085	MN -62d	7:59374
2020246	NTIS, PC A02/MF A01	DE82020246	MN -90b	7:59152
2020371	NTIS, PC A09/MF A01	DE82020371	MN -70	7:59281
2020708	NTIS MF A01	DE82020708	MN -70	7:59282
2020716	NTIS, PC A10/MF A01	DE82020716	MN -70	7:59283
2020718	NTIS, PC A09/MF A01	DE82020718	MN -70	7:59284
2021575	NTIS, PC A04/MF A01	DE82021575	MN -98E	7:59659
DOE/NE-0039	NTIS, PC A05/MF A01	DE82021692	STD -70	7:59285
DOE/NOAA/OTEC-2	NTIS, PC A08/MF A01	DE82021821	STD -64	7:59376
15	NTIS, PC A13/MF A01	DE82021823	STD -64	7:59377
18	NTIS, PC A04/MF A01	DE82021822	STD -64	7:59378
DOE/OR/05423-T1	NTIS, PC A02/MF A01	DE82020471	MN -34A	7:60312
DOE/PC/10318-2	NTIS, PC A02/MF A01	DE82022001	MN -90d	7:59114

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DOE/PC/30019-T3	NTIS, PC A11/MF A01	DE82017196	MN -92a	7:59348
DOE/PC/30294-7	NTIS, PC A02/MF A01	DE82019340	MN -90e	7:59153
DOE/PC/30340-T1	NTIS, PC A05/MF A01	DE82017075	MN -90d	7:59115
DOE/PC/40285-T4	NTIS, PC A05/MF A01	DE82020104	MN -90b	7:59154
DOE/PC/40783-T7	NTIS, PC A02/MF A01	DE82020949	STD -90a	7:59133
DOE/PC/40785-4	NTIS, PC A03/MF A01	DE82020736	STD -90d	7:59116
DOE/PMTC-8(80)	NTIS, PC A03/MF A01	DE82021811	STD -88	7:59134
DOE/RA/23213-T1	NTIS, PC A10/MF A01	DE82020698	STD -97e	7:59353
DOE/RA/50323-1-Vol.4	NTIS MF A01	DE82018298	MN -61a	7:59349
DOE/S-0010-82	NTIS, PC A09/MF A01	DE82021878	MN -13	7:59629
DOE/TIC-4581-R4	NTIS, PC A02/MF A01		STD -32	7:60703
ECN-109	NTIS (US Sales Only), MF A0106/MF A01	DE82702372	MN -38	7:59911
EDF-CONF-81E117698	NTIS (US Sales Only), MF A0102/MF A01	DE82702362	MN -41	7:60203
EDF-R-81H329994	NTIS (US Sales Only), MF A0103/MF A01	DE82702363	MN -41	7:60286
81H330210	NTIS (US Sales Only), MF A0109/MF A01	DE82702389	MN -80	7:59930
81H331068	NTIS (US Sales Only), MF A0105/MF A01	DE82702406	MN -79	7:59509
81H404234	NTIS (US Sales Only), MF A0104/MF A01	DE82702390	MN -80	7:60197
EFI-460(2) -81	NTIS (US Sales Only), MF A0102/MF A01	DE82702376	MN -28	7:60009
470(13) -81	NTIS (US Sales Only), MF A0102/MF A01	DE82702411	MN -37	7:60082
473(16) -81	NTIS (US Sales Only), MF A0102/MF A01	DE82702377	MN -28	7:59986
475(18) -81	NTIS (US Sales Only), MF A0102/MF A01	DE82702365	MN -23	7:60010
482(25) -81	NTIS (US Sales Only), MF A0102/MF A01	DE82702378	MN -28	7:59987
491(34) -81	NTIS (US Sales Only), MF A0102/MF A01	DE82702412	MN -37	7:60011
EGG-1183-1836	NTIS, PC A02/MF A01	DE82019939	MN -34B	7:60303
2192	NTIS, PC A05/MF A01	DE82019407	STD -70B	7:59286
2199	*See* NUREG/CR-2802		MN -78	7:59601
2199-App.B	*See* NUREG/CR-2802-App.B		MN -78	7:59602
2199-App.C	*See* NUREG/CR-2802-App.C		MN -78	7:59603
2210	*See* NUREG/CR-2826		MN -78	7:59604
EIR-341	Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen, Switzerland			7:59559
342	Eidgenoessisches Inst. fuer Reaktorforschung, Wuerlingen, Switzerland			7:59636
440	NTIS (US Sales Only), MF A0103/MF A01	DE82906224	MN -80	7:59537
ENDF-328	*See* EPRI-NP-2510	DE82021341	MN -80	7:59538
ENICO-1002	NTIS PCE06/MF A01	DE82021548	STD -41	7:60165
EPA-600/ 7-81-170	NTIS, PC A11/MF A01	DE82906066	MN -90i	7:59137
EPA-AA-TEB-511-81-5B	*See* PB-82-183567			7:59703
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EPRI-AP-2567	NTIS, PC A04/MF A01	DE82905493	MN -61a	7:59363
EPRI-EL-1970-Vol.3	NTIS, PC A12/MF A01	DE82906480	MN -97b	7:59470
2583-Vol.1	NTIS, PC A15/MF A01	DE82021015	MN -97a	7:59471
2583-Vol.2	NTIS, PC A07/MF A01	DE82020969	MN -97a	7:59472
EPRI-EM-2210-Vol.4	NTIS, PC A12/MF A01	DE82019781	MN -94e	7:59613
EPRI-NP-2269	NTIS, PC A07/MF A01	DE82906428	MN -80	7:59485
2425	NTIS, PC A04/MF A01	DE82906468	MN -80	7:59550
2510	NTIS, PC A99/MF A01	DE82021341	MN -80	7:59538
2529	NTIS, PC A07/MF A01	DE82905851	MN -78	7:59580
2530	NTIS, PC A08/MF A01	DE82906466	MN -78	7:59581
2531	NTIS, PC A08/MF A01	DE82906465	MN -78	7:59486
2548	NTIS, PC A07/MF A01	DE82906462	MN -77	7:59496
2564-SY	NTIS, PC A03/MF A01	DE82906463	MN -80	7:59487
2577	NTIS, PC A05/MF A01	DE82906458	MN -78	7:59582
ERL-0212-TM	*See* AD-A-112178/9			7:59932
0213-TR	*See* AD-A-112177/1			7:59931
ESG-DOE-13385	NTIS, PC A04/MF A01	DE82021125	STD -70A	7:59287
ETEC-82-11	NTIS MF A01	DE82020778	MN -66a	7:59445

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ETR-				
312	NTIS (US Sales Only), MF A0103/MF A01	DE82702642	MN -86	7:59288
EUR-				
7061-DE	*See* PB-82-182874			7:59693
7096-EN	*See* PB-82-192808			7:59368
7133-DE	*See* PB-82-182866			7:59686
7164	NTIS (US Sales Only), MF A0111/MF A01	DE82702628	MN -34C	7:60500
7340-EN	*See* PB-82-190950			7:59322
7370-EN	*See* PB-82-191123			7:60186
7621-DE	CEC, Information Market and Innovation, Luxembourg		ND -90	7:59138
7692-EN	CEC, Information Market and Innovation, Luxembourg		MN -13	7:59644
FE-				
1747-10	NTIS, PC A06/MF A01	DE82021816	STD -92a	7:59197
2291-77A	*See* CW-WR-76-020.77A	DE82020280	STD -90e	7:59460
2291-98A	*See* CW-WR-76-020.98A	DE82020287	STD -90e	7:59461
2893-89	*See* DOE/ET/10069-89	DE82020944	STD -90d	7:59107
FEI-				
1226	NTIS (US Sales Only), MF A0102/MF A01	DE82702619	MN -34C	7:60501
1235	NTIS (US Sales Only), MF A0102/MF A01	DE82702643	MN -25	7:59715
1240	NTIS (US Sales Only), MF A0102/MF A01	DE82702644	MN -25	7:59716
FERMILAB/TM-				
1124	NTIS, PC A02/MF A01	DE82021917	MN -28	7:59988
1125	NTIS, PC A02/MF A01	DE82021918	MN -37	7:60083
1127	NTIS, PC A02/MF A01	DE82021920	MN -28	7:59989
FRNC-TH-				
1032	NTIS (US Sales Only), MF A0107/MF A01	DE82780671	MN -48	7:60206
1049	NTIS (US Sales Only), MF A0108/MF A01	DE82780664	MN -48	7:60236
1051	NTIS (US Sales Only), MF A0106/MF A01	DE828780665	MN -48	7:60237
1054	NTIS (US Sales Only), MF A0111/MF A01		MN -34C	7:60457
1060	NTIS (US Sales Only), MF A0107/MF A01	DE82780668	MN -48	7:60238
1062	NTIS (US Sales Only), MF A0104/MF A01	DE83780655	MN -34D	7:60337
FWS/OBS-				
82/ 13.1	*See* PNL-3688	DE82020946	MN -97e	7:59464
82/ 13.2	*See* PNL-4088	DE82020943	MN -97e	7:59465
82/ 13.3	*See* PNL-4133	DE82020953	MN -97e	7:59466
GA-A-				
16750	NTIS, PC A03/MF A01	DE82021978	STD -20	7:60564
16764	NTIS, PC A06/MF A01	DE82021662	STD -77	7:59497
GAO/PART-				
82-1	NTIS, PC A04/MF A01 - Professional Audit Review Team, Room 308-100 Indiana Ave. NW, Washington, DC 20001	DE82905231	MN -98	7:59631
GAT-				
996	NTIS, PC A04/MF A01	DE82020571	MN -22	7:59261
GAT/GDP-				
1100	NTIS, PC A04/MF A01	DE82020074	MN -13	7:59473
GC-TR-				
82-165	*See* AD-A-112597/0			7:59905
GEND-INF-				
022	NTIS, PC A02/MF A01	DE82021877	MN -78	7:59488
GJBX-				
40-82	NTIS MF A01	DE82020450	MN -51	7:59238
66-82	NTIS MF A01	DE82020438	MN -51	7:59239
69-82	NTIS MF A01	DE82020436	MN -51	7:59240
78-82	NTIS MF A01	DE82020431	MN -51	7:59241
80-82	NTIS MF A01	DE82020430	MN -51	7:59242
85-82	NTIS MF A01	DE82020429	MN -51	7:59243
87-82	NTIS MF A01	DE82020417	MN -51	7:59244
88-82	NTIS MF A01	DE82020453	MN -51	7:59245
114-82	NTIS, PC A10/MF A01	DE82020500	MN -51	7:59246
138-82	NTIS, PC A06/MF A01	DE82020327	MN -51	7:59247
139-82	NTIS MF A01	DE82020448	MN -51	7:59248
140-82	NTIS MF A01	DE82020447	MN -51	7:59249
143-82	NTIS MF A01	DE82020446	MN -51	7:59250
156-82	NTIS, PC A06/MF A01	DE82020961	MN -51	7:59251
195-82-Vol.1	NTIS PCE07/MF $9.98	DE82021614	MN -51	7:59252
195-82-Vol.2A-Christmas	NTIS, PC A12/MF A01	DE82021620	MN -51	7:59257
195-82-Vol.2A-GreenValley	NTIS, PC A99/MF A01	DE82021624	MN -51	7:59255
195-82-Vol.2A-Solitario	NTIS, PC A17/MF A01	DE82021619	MN -51	7:59256
195-82-Vol.2B-Christmas	NTIS, PC A09/MF A01	DE82021621	MN -51	7:59236
195-82-Vol.2B-GreenValley	NTIS, PC A14/MF A01	DE82021623	MN -51	7:59237
195-82-Vol.2B-Solitario	NTIS, PC A08/MF A01	DE82021622	MN -51	7:59235
GRS-A-				
638	Gesellschaft fuer Reaktorsicherheit (GRS) mbH, Glockengasse 2'5000 Koeln 1, GE		ND -78	7:59583
HEDL-SA-				
2554-FP	NTIS, PC A02/MF A01	DE82020501	MN -79b	7:59510
2584-FP	NTIS, PC A02/MF A01	DE82020514	MN -79p	7:59584
2587-FP	NTIS, PC A02/MF A01	DE82018097	MN -79p	7:59585
2592-FP	NTIS, PC A02/MF A01	DE82020279	MN -79p	7:59511

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2606-FP	NTIS, PC A02/MF A01	DE82020513	MN -79p	7:59586
2614	NTIS, PC A02/MF A01	DE82020512	MN -79p	7:59566
2637-FP	NTIS, PC A02/MF A01	DE82020617	MN -79a	7:59512
2650	NTIS, PC A02/MF A01	DE82020641	MN -25	7:60131
2683	NTIS, PC A02/MF A01	DE82020504	MN -79b	7:59717
2727	NTIS, PC A02/MF A01	DE82020502	MN -79p	7:59513
HEDL-TC-				
362	NTIS, PC A02/MF A01	DE82022042	MN -70	7:59289
HEDL-TME-				
81-37	NTIS, PC A05/MF A01	DE82020505	STD -20c	7:59718
IAEA-R-				
1626-F	NTIS (US Sales Only), MF A0102/MF A01	DE82702366	MN -23	7:59341
1815-F	NTIS (US Sales Only), MF A0102/MF A01	DE82702374	MN -38	7:59965
2310-F	NTIS (US Sales Only), MF A0102/MF A01		MN -37	7:60084
IMMR-				
82/ 066	IMMR, Publications Office, PO Box 13015, Lexington, KY 40512			7:59199
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2869	NTIS, PC A06/MF A01 - GPO $5.50		MN -51	7:59259
2885	NTIS, PC A04/MF A01 - GPO		MN -78	7:59605
NVO-				
196-31	NTIS, PC A05/MF A01	DE82021099	STD -70	7:59301
NWC-TP-				
5960	*See* AD-A-112664/8			7:59672
OENORM-S-				
2600	Oesterreichisches Normungsinstitut A-1020 Vienna, Leopologasse 4, Austria		MN -70	7:59271
ORAU/IEA-				
82-7(M)	NTIS, PC A07/MF A01	DE82021951	MN -66a	7:59414

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5814	NTIS, PC A04/MF A01	DE82020476	STD -11	7:60177
5868	NTIS, PC A05/MF A01	DE82020489	MN -11	7:60170
5880	NTIS, PC A05/MF A01	DE82020706	MN -70	7:59302
ORNL/CSD-				
105	NTIS, PC A06/MF A01	DE82021531	STD -32	7:60693
ORNL/NUREG-				
75	*See* NUREG/CR-2609		MN -78	7:59598
ORNL/NUREG/TM-				
455-Vol.2	*See* NUREG/CR-2182-Vol.2		MN -78	7:59595
ORNL/SGMP-				
82/ 1	NTIS, PC A04/MF A01	DE82019890	MN -90	7:59118
ORNL/TM-				
6803/ S3	NTIS, PC A03/MF A01	DE82020479	MN -11	7:60171
7751	NTIS, PC A04/MF A01	DE82020487	MN -11	7:60172
7864	*See* NUREG/CR-2183		MN -78	7:59596
8256	NTIS, PC A03/MF A01	DE82020477	STD -20	7:60571
8270	NTIS, PC A04/MF A01	DE82020478	MN -11	7:60188
8323	NTIS, PC A08/MF A01	DE82020457	STD -90c	7:59119
8331	*See* NUREG/CR-2710		MN -78	7:59600
8346	NTIS, PC A04/MF A01	DE82021534	STD -77	7:59500
8351	NTIS, PC A02/MF A01	DE82020484	MN -70	7:59303
8405	NTIS, PC A02/MF A01	DE82020480	MN -41	7:60183
8423	NTIS, PC A04/MF A01	DE82020483	MN -41	7:60245
8439	NTIS, PC A03/MF A01	DE82020490	MN -90i	7:59141
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A 317,706		DE82020876		7:59928
A 317,816		DE82020875		7:60126
A 317,818		DE82020874		7:59670
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A 318,081		DE82020872		7:59260
A 318,668		DE82020871		7:59835
A 321,345		DE82020889		7:59927
A 321,346		DE82020888		7:59155
A 321,946		DE82020866		7:60125
A 322,042				7:59939
A 322,143		DE82020867		7:59338
A 322,144		DE82020868		7:59321
A 323,149		DE82020870		7:59410
A 323,150		DE82020845		7:60055
A 326,087		DE82020844		7:59926
A 328,327		DE82020842		7:59777
A 335,995		DE82020846		7:59556
A 335,997		DE82020862		7:59628
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82-109901	NTIS		MN -88	7:59147
82-157637	NTIS, PC A02/MF A01			7:60058
82-172917	NTIS, PC A05/MF A01			7:60283
82-179417	NTIS, PC A03/MF A01			7:59698
82-179920	NTIS, PC A05/MF A01			7:60189
82-180191	NTIS, PC A02/MF A01			7:59695
82-180266	NTIS, PC A04/MF A01			7:59946
82-180282	NTIS, PC A11/MF A01			7:59606
82-182098	NTIS, PC A13/MF A01			7:60155
82-182866	NTIS PCE03/MF E03			7:59686
82-182874	NTIS PCE11/MF E11			7:59693
82-183104	NTIS, PC A12/MF A01			7:59148
82-183112	NTIS, PC A07/MF A01			7:59149
82-183492	NTIS, PC A08/MF A01			7:60198
82-183500	NTIS, PC A11/MF A01			7:60199
82-183518	NTIS, PC A14/MF A01			7:60200
82-183526	NTIS, PC A10/MF A01			7:60201
82-183567	NTIS, PC A09/MF A01			7:59703
82-184953	NTIS, PC A09/MF A01			7:59351
82-185331	NTIS, PC A04/MF A01			7:59630
82-185505	NTIS, PC A07/MF A01			7:60156
82-187261	NTIS, PC A02/MF A01			7:60319
82-187485	NTIS, PC A07/MF A01			7:59176
82-188012	NTIS, PC A03/MF A01			7:60157
82-188137	NTIS, PC A02/MF A01			7:59150
82-188244	NTIS, PC A24/MF A01			7:60190
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82-188939	NTIS, PC A03/MF A01			7:60572
82-189317	NTIS, PC A04/MF A01			7:60284
82-190141	NTIS, PC A19/MF A01			7:59174
82-190174	NTIS, PC A17/MF A01			7:59177
82-190950	NTIS PCE06/MF E06			7:59322
82-191123	NTIS PCE06/MF E06			7:60186
82-192808	NTIS PCE03/MF E03			7:59368
82-193061	NTIS, PC A08/MF A01			7:60149
82-195637	NTIS, PC A03/MF A01			7:59668
82-195645	NTIS, PC A02/MF A01			7:59845
82-195652	NTIS, PC A05/MF A01			7:59183
82-196361	NTIS, PC A03/MF A01			7:59964
82-196858	NTIS, PC A10/MF A01			7:59142
82-196932	NTIS, PC A07/MF A01			7:59120
82-197153	NTIS, PC A10/MF A01			7:59143
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82-198847	NTIS, PC A08/MF A01			7:59700
82-198995	NTIS, PC A08/MF A01			7:59179
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82-199027	NTIS, PC A08/MF A01			7:59180
82-199043	NTIS, PC A03/MF A01			7:59346
82-200585	NTIS, PC A06/MF A01			7:59690
82-200593	NTIS, PC A13/MF A01			7:59691
82-200601	NTIS, PC A02/MF A01			7:59121
82-200643	NTIS, PC A10/MF A01			7:59178
82-200676	NTIS, PC A06/MF A01			7:59669
PETC-				
10318-2	*See* DOE/PC/10318-2	DE82022001	MN -90d	7:59114
PFC/RR-				
82-14	*See* DOE/ET/51013-49	DE82021688	STD -20f	7:60561
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099-82	NTIS PCE05/MF A01	DE82020602	MN -51	7:59253
PNL-				
3117-Vol.3	*See* NUREG/CR-1030-Vol.3		MN -70	7:59327
3688	NTIS, PC A05/MF A01	DE82020946	MN -97e	7:59464
3721	NTIS, PC A06/MF A01	DE82021966	MN -71	7:59272
3870	NTIS, PC A04/MF A01	DE82021376	MN -60	7:59457
4053	NTIS, PC A04/MF A01	DE82020409	MN -12	7:59444
4088	NTIS, PC A03/MF A01	DE82020943	MN -97e	7:59465
4089	NTIS, PC A03/MF A01	DE82021962	MN -70	7:59304
4133	NTIS, PC A03/MF A01	DE82020953	MN -97e	7:59466
4222	NTIS, PC A03/MF A01	DE82021708	MN -90d	7:59144
4267	*See* NUREG/CR-2709		MN -78	7:59914
4352	*See* DOE/ET/34215-30	DE82021749	STD -78	7:59479
4362	NTIS, PC A05/MF A01	DE82018829	STD -95f	7:59692
4383	NTIS, PC A05/MF A01	DE82021965	MN -15	7:59336
PPG-				
609	*See* AD-A-112598/8			7:60305
PPPL-				
1919	NTIS, PC A03/MF A01	DE82020784	STD -20f	7:60573
1924	NTIS, PC A04/MF A01	DE82020266	MN -20f	7:60574
1926	NTIS, PC A04/MF A01	DE82020258	STD -20f	7:60597
PSI-TR-				
338	*See* DOE/PC/30294-7	DE82019340	MN -90e	7:59153
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3-A	*See* PB-82-188244			7:60190
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81-310	*See* AD-A-112627/5			7:60307
RFP-				
3279	NTIS, PC A03/MF A01	DE82021953	STD -37	7:59915
3290	NTIS, PC A03/MF A01	DE82021737	STD -37	7:60139
3296	NTIS, PC A02/MF A01	DE82021536	STD -70	7:59305
3387	NTIS, PC A25/MF A01	DE82021712	STD -60	7:59458
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321	NTIS, PC A02/MF A01	DE82020134	MN -4	7:59270
331	NTIS, PC A02/MF A01	DE82020380	MN -4	7:59833
332	NTIS, PC A02/MF A01	DE82020403	MN -4	7:59831
333	NTIS, PC A02/MF A01	DE82020404	MN -4	7:59832
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RHO-BW-SA-				
228P	NTIS, PC A02/MF A01	DE82020780	MN -70	7:59307
231A-P	NTIS, PC A03/MF A01	DE82019256	MN -70	7:59323
RHO-HS-SR-				
5P	NTIS, PC A05/MF A01	DE82020562	MN -11	7:60193
82-4-P	NTIS, PC A06/MF A01	DE82021929	MN -11	7:60184
RL-				
81-080	NTIS (US Sales Only), MF A0106/MF A01	DE82780637	MN -20	7:60362
81-083	*See* PB-82-157637			7:60058
RLO-				
1388-873	NTIS, PC A05/MF A01	DE82020191	MN -34D	7:60358
01388-871	NTIS, PC A04/MF A01	DE82020192	MN -34D	7:60359
SAI-				
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81-2390C	NTIS, PC A03/MF A01	DE82006282	MN -62	7:59387
82-0125C	NTIS, PC A03/MF A01	DE82020183	MN -34	7:59767
82-0261C	NTIS, PC A02/MF A01	DE82020626	MN -66c	7:59453
82-0283C	NTIS, PC A02/MF A01	DE82020406	MN -78	7:59607
82-0451C	NTIS, PC A02/MF A01	DE82020821	MN -78	7:59483
82-0635C	NTIS, PC A02/MF A01	DE82017623	MN -45	7:60306
82-0636C	NTIS, PC A02/MF A01	DE82019486	MN -2	7:60678
82-0663	NTIS, PC A02/MF A01	DE82017026	MN -25	7:59784
82-0711C	NTIS, PC A02/MF A01	DE82018749	MN -2	7:59917
82-0856C	NTIS, PC A02/MF A01	DE82019735	MN -38	7:59955
82-0956C	NTIS, PC A02/MF A01	DE82020356	MN -90c	7:59122
82-0958C	NTIS, PC A02/MF A01	DE82020627	MN -90c	7:59123
82-0970C	NTIS, PC A02/MF A01	DE82020354	MN -90c	7:59918
82-0971C	NTIS, PC A02/MF A01	DE82020357	MN -90c	7:59919
82-0988C	NTIS, PC A02/MF A01	DE82020311	MN -90c	7:59124
82-1045C	NTIS, PC A02/MF A01	DE82021726	MN -70	7:59308
82-1088C	NTIS, PC A02/MF A01	DE82016723	MN -94	7:59956
82-1215C	NTIS, PC A02/MF A01	DE82022027	MN -78	7:59608
82-1370	NTIS, PC A02/MF A01	DE82021121	MN -41	7:60287
82-1374C	NTIS, PC A02/MF A01	DE82016701	MN -66c	7:59454
82-1404C	NTIS, PC A02/MF A01	DE82017071	MN -66c	7:59455
82-1435C	NTIS, PC A02/MF A01	DE82016787	MN -66a	7:59456
82-1486C	NTIS, PC A02/MF A01	DE82019487	MN -04	7:59768
82-1584	NTIS, PC A02/MF A01	DE82020884	MN -32	7:60694
82-1631C	NTIS, PC A02/MF A01	DE82018973	MN -32	7:59920
82-1682C	NTIS, PC A02/MF A01	DE82019345	MN -25	7:60325
82-1710C	NTIS, PC A02/MF A01	DE82019431	MN -70	7:59273
82-1724C	NTIS, PC A02/MF A01	DE82019346	MN -34D	7:60512
82-1789C	NTIS, PC A02/MF A01	DE82020358	MN -38	7:59745
82-1792C	NTIS, PC A02/MF A01	DE82020093	MN -34A	7:59824
82-1837C	NTIS, PC A02/MF A01	DE82020035	MN -2	7:60146
82-1838C	NTIS, PC A02/MF A01	DE82020101	MN -97a	7:59957
82-1841C	NTIS, PC A02/MF A01	DE82020353	MN -45	7:60143
82-1894C	NTIS, PC A02/MF A01	DE82020625	MN -85	7:59274
82-1908C	NTIS, PC A02/MF A01	DE82020628	MN -32	7:60695
82-1943C	NTIS, PC A02/MF A01	DE82020405	MN -37	7:60140
82-1987C	NTIS, PC A02/MF A01	DE82020413	MN -78	7:59609
82-2001C	NTIS, PC A02/MF A01	DE82022026	MN -78	7:59610
82-2005C	NTIS, PC A02/MF A01	DE82020606	MN -78	7:59611
82-7011	*See* NUREG/CR-2585		MN -78	7:59482
82-8006	NTIS, PC A02/MF A01	DE82021706	MN -32	7:60696
82-8016	NTIS, PC A03/MF A01	DE82021126	MN -13	7:59921
82-8020	NTIS, PC A02/MF A01	DE82021707	MN -38	7:59922
82-8190	NTIS, PC A02/MF A01	DE82020118	MN -62d	7:59407
82-8224	NTIS, PC A03/MF A01	DE82020858	MN -25	7:59746
82-8230	NTIS, PC A02/MF A01	DE82020886	MN -32	7:59846
82-8231	NTIS, PC A03/MF A01	DE82020887	MN -32	7:60697
82-8232	NTIS, PC A03/MF A01	DE82019995	MN -32	7:60147
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234-1470	NTIS, PC A02/MF A01	DE82021612	MN -61a	7:59365
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234-1654	NTIS, PC A03/MF A01	DE82019768	MN -61a	7:59366
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611-848	NTIS, PC A02/MF A01	DE82021747	MN -63	7:59367
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211-1669	NTIS, PC A04/MF A01	DE82020419	MN -58a	7:59645
214-1567-Vol.1	NTIS, PC A09/MF A01	DE82021958	MN -63	7:59371
214-1567-Vol.2	NTIS, PC A11/MF A01	DE82021683	MN -63	7:59372
253-1429	NTIS, PC A03/MF A01	DE82021968	MN -59c	7:59389
253-1450	NTIS, PC A04/MF A01	DE82021611	MN -59	7:59408
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82/ 07	NTIS, PC A05/MF A01	DE82021702	STD -59	7:59355
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82/ 14	NTIS, PC A05/MF A01	DE82021303	STD -59	7:59390
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82/ 14	NTIS, PC A04/MF A01	DE82021698	STD -59	7:59399
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82/ 14	NTIS, PC A05/MF A01	DE82021302	STD -59	7:59400
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82/ 14	NTIS, PC A05/MF A01	DE82021353	STD -59	7:59401
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82/ 14	NTIS, PC A05/MF A01	DE82021356	STD -59	7:59402
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82/ 14	NTIS, PC A04/MF A01	DE82021697	STD -59	7:59404
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82/ 14	NTIS, PC A05/MF A01	DE82021703	STD -59	7:59405
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82/ 14	NTIS, PC A05/MF A01	DE82021301	STD -59	7:59406
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80-432	NTIS (US Sales Only), MF A0103/MF A01	DE82702104	MN -11	7:60195
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82-19	NTIS (US Sales Only), MF A0102/MF A01	DE82906210	MN -34D	7:60352
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0350	*See* SAND-82-1894C	DE82020625	MN -85	7:59274
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82/ 10	NTIS, PC A03/MF A01	DE82904382	MN -78	7:59565
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82/ 12	NTIS, PC A04/MF A01	DE82904671	MN -11	7:60159
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81/ 34	*See* EPA-600/7-81-170	DE82906066	MN -90i	7:59137
TVA/PUB-				
82/ 11	NTIS, PC A02/MF A01	DE82905981	MN -13	7:59517
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17271-82	NTIS, PC A04/MF A01	DE82020857	MN -34	7:59635
18509-82-1-2	NTIS, PC A03/MF A01	DE82021945	MN -34A	7:59847
19120-Rev.1	NTIS, PC A02/MF A01	DE82021546	MN -97b	7:59475
19416	NTIS, PC A02/MF A01	DE82021545	MN -90c	7:59125
19436	NTIS, PC A05/MF A01	DE82020345	MN -32	7:59923
19459	NTIS, PC A02/MF A01	DE82021547	MN -97b	7:59476
19483	NTIS, PC A02/MF A01	DE82020426	MN -21	7:60598
19488	NTIS, PC A06/MF A01	DE82021685	MN -38	7:60698
19492	NTIS, PC A12/MF A01	DE82021539	MN -70	7:59309
19494	NTIS, PC A03/MF A01	DE82021551	MN -34A	7:60575
19495	NTIS, PC A02/MF A01	DE82021549	MN -34A	7:60576
19496	NTIS, PC A02/MF A01	DE82021550	MN -70	7:59310
19497	NTIS, PC A08/MF A01	DE82021949	MN -66a	7:59442
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19505	NTIS, PC A02/MF A01	DE82021948	MN -11	7:60298
19541	NTIS, PC A02/MF A01	DE82021350	MN -34D	7:60517
19548	NTIS, PC A04/MF A01	DE82021010	MN -91	7:59217
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15467-Pt.2	NTIS, PC A04/MF A01	DE82017634	MN -21	7:60599
50007-81	NTIS, PC A04/MF A01	DE82020423	MN -41	7:60288
50016-82-2	NTIS, PC A03/MF A01	DE82020614	STD -38	7:59924
50026-82-1	NTIS, PC A02/MF A01	DE82020455	STD -90c	7:59126
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52868-Rev.1	NTIS, PC A04/MF A01	DE82021961	MN -21	7:60601
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53188-81	NTIS, PC A05/MF A01	DE82020575	STD -70	7:59311
53220	NTIS, PC A03/MF A01	DE82021537	STD -62	7:59409
53295	NTIS, PC A07/MF A01	DE82020610	STD -20	7:60577
53301	NTIS, PC A02/MF A01	DE82020491	STD -11	7:60271
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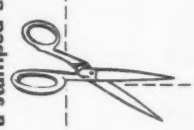

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